THE

ELECTRICAL REVIEW.

VOL. LXXV. SEPTEMBER 4, 1914. No. 1,919.

ELECTRICAL REVIEW.

Vol. LXXV.] CONTENTS: September 4, 1914. [No. 1,919.

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THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. *Established 1872.*

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGEEKAY, LONDON." Code, A B C.

Telephone Nos.: Holborn 933; Central 4425 (Editorial only).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

Subscription Rates.—Per annum, postage inclusive, in Great Britain, 19s. 6d.; Canada, £1 1s. 8d. ($5.30). To all other countries, £1 10s.

FOREIGN AGENTS:

ADELAIDE: Messrs. Atkinson & Co., Gresham Street.
AUCKLAND, N.Z.: Gordon & Gotch, Albert Street; The Mining and Engineering Review, 31a, Strand Arcade, Queen Street.
BERLIN: Asher & Co., Unter den Linden; Speyer & Peters, Unter den Linden 43, N.W. 7.
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LAUNCESTON: Gordon & Gotch, Cimitiere Street.
MELBOURNE: The Mining & Engineering Review, 90, William Street; Gordon & Gotch, Queen Street.
MILAN: Fratelli Treves.
NEW YORK: D. Van Nostrand, 25, Park Place.
PARIS: Boyveau & Chevillet, 22, Rue de la Banque.
PERTH, W.A.: Gordon & Gotch, William Street.
ROME: Loescher & Co., Corso Umberto 1° 307.
SYDNEY: The Mining & Engineering Review, 273, George Street; Gordon and Gotch, Pitt Street.
TORONTO, ONT.: Wm. Dawson & Sons, Ltd., Manning Chambers; Gordon and Gotch, 132, Bay Street.
WELLINGTON, N.Z. Gordon & Gotch, Cuba Street.

Chquees and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, and crossed "London City and Midland Bank, Newgate Street Branch."

THE UNIVERSAL ELECTRICAL DIRECTORY

(J. A. Berly's).

1914 EDITION

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill, London, E.C.

THE WAR AND BRITISH ELECTRICAL INDUSTRY.

DURING the last few weeks we have received a number of communications, intended for publication, respecting electrical and allied firms carrying on operations in this country. Some of them have been unaccompanied by the writers' names, and these we accordingly put aside. Others have asked questions relating to particular companies, and while it may be that there is some justification for the implication they seek thus to make, we prefer in such a connection to have statements of fact rather than suggestions. Several of the communications appear in our "Correspondence" pages to-day.

Clearly the international upheaval that is in progress at this moment is going to have many other consequences besides alterations on the maps. The affairs of firms appearing to be British manufacturers are being very searchingly examined in these days of war, and the facts brought to light will be remembered in days to come. Questions are being asked in Parliament, in the Press, and amongst the public as to the extent to which certain firms may be regarded as British. One of our correspondents advances a suggestion which we commend to the attention of the British Electrical and Allied Manufacturers' Association. Doubtless that organisation, either officially or through its members, knows better than anybody else the extent to which firms connected with the trade are under British ownership and control, and how far they are under the influence of alien enemies or alien capital. From an answer given by Mr. Runciman in the House of Commons on Monday last, respecting the well-known firms of Siemens and the large German holding of the capital therein (referred to in our "War Items" to-day), it will be seen that the general position of limited companies in this country which are controlled by alien enemies is at present receiving attention at the hands of the Government. Messrs. Siemens Bros. & Co., Ltd., have issued a statement to the effect that they have made a special reference to the Government, and have received a most satisfactory reply as to carrying on their business as usual. We may know more as to the result of the Government investigation before we go to press, but it seems to us that the present is pre-eminently a suitable moment for the B.E.A.M.A. to place its special knowledge at the disposal of the Government and the public, for it is not possible to ascertain the extent to which any particular business connected with the electrical industry is British without something in the nature of special knowledge.

We venture to suggest to some of our correspondents that there is a danger in jumping to the conclusion that everything and everybody with a German name is of German sympathies, and has interests and connections amongst our present enemies. It is also a question for consideration how far

works giving employment to thousands of British workmen should be considered German because the shares are held by aliens resident here or in the countries with which we are at war. Let it not be forgotten that German Industrial Banks (which, however, have no counterpart here), owing to their constitution and ability, have long assisted industrial enterprises more readily than British Banks. One of the great objects of the Patents Act of 1907, too, was to compel foreigners to engage in manufacturing operations here. We have no doubt that the Government which has inspired such confidence everywhere by its conduct of affairs since war broke out, may be trusted to adopt a reasonable and appropriate course of action respecting such concerns for the period of the war, and to see that profit on Government contracts does not find its way to Germany.

We are aware that while many electrical firms are working at full pressure, or are short-handed, others are temporarily inconvenienced, and there are not wanting those who think that it would assist recruiting to close down operations to some extent instead of our trying to keep all workmen employed. Some engineering firms have actually dismissed all their single men, giving them an undertaking to keep places open for all who serve under the colours. Unfortunately there is already much unemployment, and we shall do well not to add to it unless for supreme national reasons it is necessary to do so.

The Government has already ruled in its stipulations respecting trading with the enemy that the important thing to consider is where the foreign trader resides, and carries on business, and not the nationality of the foreign trader. "Consequently, there is, as a rule, no objection to British firms trading with German or Austrian firms established in neutral or British territory. What is prohibited is trade with any firms established in hostile territory." Further: "If a firm with headquarters in hostile territory has a branch in neutral or British territory, trade with the branch is (apart from prohibitions in special cases) permissible, as long as the trade is *bonâ fide* with the branch, and no transaction with the head office is involved." It remains to be seen whether and how far the Government, as the result of its present investigation, will see fit to amend the terms of its proclamation.

It is very satisfactory to note the progress that is being made with the Prince of Wales's Fund. We will not, however, in expressing our satisfaction, attempt to conceal our regret that cases are not unknown of electrical and allied firms who, after giving generously to this fund, have reduced wages and salaries. The dismissing of men and the reduction of wages are measures to be strongly deprecated, save in cases of absolute necessity; and these of which we hear certainly cannot be described as such. It is reported in several papers that British electrical manufacturers have already secured about a million pounds' worth of contracts which have been cancelled with alien firms. It is unlikely that such work has been undertaken at unprofitable prices—why, then, make the workers suffer?

German Exports.

On page 330 we publish an analytica statement of the exports of electrical goods from Germany, which we have had specially prepared, and which should be of considerable interest to British manufacturers at this time. We print also a map, similar to that published in our issue of August 14th, showing broadly the principal markets to which the German manufactures are consigned.

In comparing this with the map previously published, the reader should bear in mind that the figures for German exports relate to *the whole of the year* 1912, whilst in the case of the British exports the *average monthly* figures for the current year are given. It will be seen that there is abundant scope for British enterprise, especially in Russia and Italy, both friendly European countries; in South America; in Japan; and in the British Empire itself.

While the United States is also in a position to manufacture for export, its competition is at present hampered by the lack of transport facilities, for the American mercantile marine is of inconsiderable dimensions and is largely occupied in coastal trade; moreover, a large proportion of the German exports has been carried in British ships, most of which are at the disposal of our trade. Good prices can be obtained in the absence of German competition, and if the opportunity is seized our industries should reap a rich harvest.

Rubber.

As was only to be expected, business in the rubber market has been conducted upon a very narrow basis during the last few weeks, and, indeed, for the earlier part of the month things were in a state of suspense. The prime consideration was, of course, the extent to which supplies would be interfered with from the East. At the end of July the stocks of plantation rubber in London totalled about 3,200 tons, and it was not lost sight of that this was only a very moderate quantity for the trade to take hold of, should it happen that there was a protracted withholding of supplies from the East.

That this consideration acted as a stiffening factor goes without saying. The periodical auctions, which were suspended for a time, were resumed last week, after an interval of nearly a month, and the market was watched therefore with an unusual amount of interest. The total quantity on offer was small, only about 380 tons, of which some 300 tons were of Malay production and the remainder from Ceylon, and the main feature which aroused comment was the exceedingly small supply available of the fine crepe sorts. It appeared that during the period when the auctions were suspended, there had been a capital demand for this description, and the quantities which could be dealt with were mostly disposed of on private terms. Otherwise the assortment of rubber on offer was rather poor, and competition none too brisk.

There was a pretty encouraging inquiry recently for the United States, and at times spot parcels displayed a considerable amount of firmness, but as soon as the buying on this account fell away the market at once took on an easier appearance. It may seem strange, under trade conditions, that the American demand should have attained any proportions until it is remembered that the United States took fright over the war, importers and consumers being afraid that their supplies from the East and from Brazil would be cut off by the paralysis of the world's carrying trade by sea, owing to the war, and also by the impossible position of the foreign exchanges. This was responsible for a jump of a sensational character in the American price, and Ceylon rubber for the first time on record went in America to over fine Para—the advance being 100 per cent., with few sellers even at that remarkable appreciation. The rise was followed, however, by a big fall. There is a decided shortage in the available stocks of rubber in the United States, and responsible organs across the Atlantic have been preaching prices even higher.

If the seas can be cleared of piratical German cruisers masquerading as peaceful liners, the position should at once assume a different complexion, and as it is, the situation has cleared considerably. The United States, of course, has to import every ton of rubber which it uses, and is particularly fond of the Brazilian product, the output of which is

falling off, being last year 42,000 tons, and estimated this year at 39,000 tons. Nevertheless it must be recognised that the prices recently ruling in America are quite artificial, and that a resumption of values more in accord with the actual position is assured with improved shipping and financial facilities.

A cable received by the Malay States Information Agency from the Colonial Secretary, Singapore, states that the exports of plantation rubber during July amounted to 1,584 tons, compared with 1,480 tons in June last and 1,120 tons in July last year. The total exports for the seven months amount to 10,090 tons, against 5,933 tons in the corresponding period last year.

British Trade in Australia.

A report on the trade of Australia for the year 1913, by Mr. G. T. Milne, H.M. Trade Commissioner in Melbourne, has just been issued by the Board of Trade. Both imports and exports in 1913 show a slight decline as compared with the figures for 1912, but the Trade Commissioner holds that conditions are prosperous, and that the outlook is generally favourable to further expansion of trade. The report, which gives a review of the trade in particular classes of goods, and discusses generally the main features of the trade position, should be of interest to firms trading, or desiring to trade, with Australia. On another page we print certain extracts from the report of more particular interest to our readers. It will be sufficient to refer here to one or two broad questions raised. In the first place, Mr. Milne apparently considers that the next few years will witness a growth of American trade with the Commonwealth. The revision of the American tariff whereby wool and meat are placed on the free list, the increase in shipping facilities between the Pacific seaboard of the United States and some of the ports of the Commonwealth, and the advantages that will be conferred on the manufacturers in the Eastern portion of the United States by the opening of the Panama Canal, are all-important factors favourable to the development of the trade of the Commonwealth with that country. In view of this fact, the Trade Commissioner advises increased activity on the part of British manufacturers, and suggests a visit of a number of manufacturers representative of British industries similar to that recently paid to Australia by representatives of the National Association of Manufacturers of the United States. The total imports into Australia in 1913 amounted to £77,248,000, but a considerable deduction must be made from this total in order to arrive at the total of competitive trade (*i.e.*, trade from which the United Kingdom is not able to compete). The details of this deduction for 1913 are not available, but in 1912 it amounted to £17,000,000. The proportion of the imports of competitive merchandise supplied by the United Kingdom was 62·58 per cent. in 1912; the respective proportions supplied by United States and Germany were 11·76 and 11·42 per cent.; and it is noticeable that while the British percentage, though higher than in 1911, has decreased from 63·61 per cent. in 1909, the American percentage shows a steady increase. Dealing with the question of preference, Mr. Milne points out that "there exist not only a fiscal preference but also what may be termed commercial and sentimental preferences in favour of the Mother Country," but adds that although in some cases buyers may be prepared to pay a higher price for the British-made article, it is not advisable for our firms to count too much on this factor. As regards the fiscal preference, he touches lightly on the vexed question of the neutralisation of the advantage of preference to British goods by the lower freight rates from foreign countries, observing that this circumstance, combined with certain others, may be taken to explain the fact that in metals and machinery, notwithstanding the preference, our foreign competitors have materially increased their relative and actual positions. Though the report is short, it gives a useful summary of the present position in Australia, with some hints as to the methods by which British trade with the Commonwealth may be improved. It is of particular interest at this juncture, having in mind the important trade which Germany has been able to work up and which she will now certainly lose, that trade in electrical goods is by no means the least important part of Germany's total; and in view of the prosperity existing in Australia, and the extensive electrical work under way, some in German hands, our firms should find a particularly valuable field in that Dominion.

West Indies and Cables.

Some considerable time has elapsed since the famous Ottawa Conference took place, when questions of trade and commerce, as well as of communications between Canada, Great Britain and the West Indies were fully discussed and various resolutions passed. It is, therefore, somewhat of a relief to know that a definite step has been taken and progress registered. The agreement between His Majesty's Government, the Government of the Dominion of Canada, and the West India and Panama Telegraph Co. has just been published as a White Paper, the House of Lords having approved the agreement on August 12th.

A substantial reduction of rates has been secured, and the differential treatment of the route afforded by cables laid between Jamaica and Halifax, Nova Scotia, has been abolished, but we regret that apparently nothing has been done to secure an all-British connection to the British Islands beyond Jamaica. Generally, the Governments are to be congratulated on having concluded a very advantageous contract, as, having in view the restricted traffic ground, the important reductions of rates secured for both local and general business cannot lead, in our opinion, to an increased revenue sufficient to meet the consequent loss. The giving of additional subsidies is, therefore, quite justifiable, but whether they be sufficient remains to be seen, particularly as after the fourth year they become merely traffic guarantees.

It would appear that for the purposes of the guarantee the subsidy received from the Danish Islands is to be included in the gross revenue.

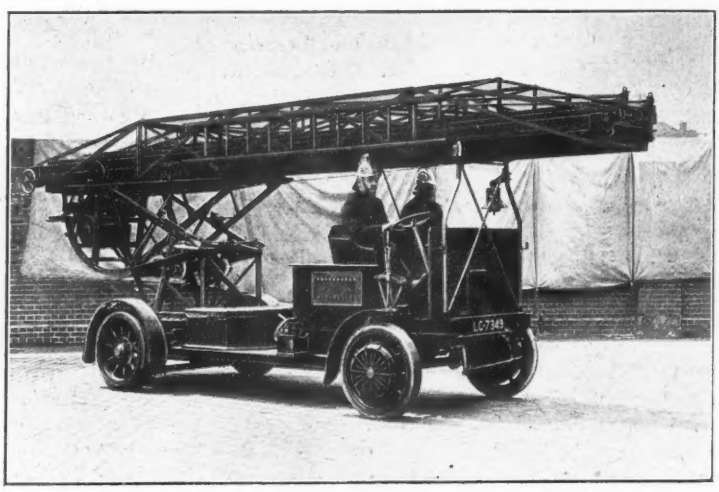
Perhaps the most important aspect of the agreement is dealt with in Clause 7, where provision is made that the chairman and the majority of the other directors shall be British subjects, and the West India and Panama Telegraph Co. shall not at any time be or become directly or indirectly controlled by foreigners or a foreign corporation. It is a very wise provision, and we think the drafting of this clause might well have been even more drastic. It might have provided, in view of even British directors being possibly substantially or mainly interested in foreign-owned or controlled concerns, that anybody was barred from serving in the capacity of director or other official who by way of salary, directorship, agency or in any other manner, was interested in undertakings of a similar nature controlled by foreign corporations or persons. Nobody will deny that in view of the present political situation, this is a very serious question, and personalities should not be allowed to weigh in the matter, for a dependent or servant of a foreigner must either do as he is told or leave, and no man would be human if his inclination did not stray in the direction either of his major interests or of his living. We particularly deplore that foreign directors should be permitted on the board of a company looked upon as "British," for they would acquire important knowledge of Government requirements with full liberty of communicating them to other Governments. Little purpose would be served by asking them to resign in the event of war, for by then the damage would have been done. In our opinion, the affairs of such undertakings as the West India and Panama Telegraph Co., or any other company or undertaking upon which the safety and well-being of our Colonies and the Empire depend, should be managed and controlled by British subjects, uncontrolled by and not interested in a foreign or foreign-controlled business or person, and a representative of the particular Government Department interested should be specially appointed to the board to see that the Empire's interests were absolutely safeguarded.

SOME NOTES ON THE ELECTRIC VEHICLE EQUIPMENT OF THE LONDON FIRE BRIGADE.

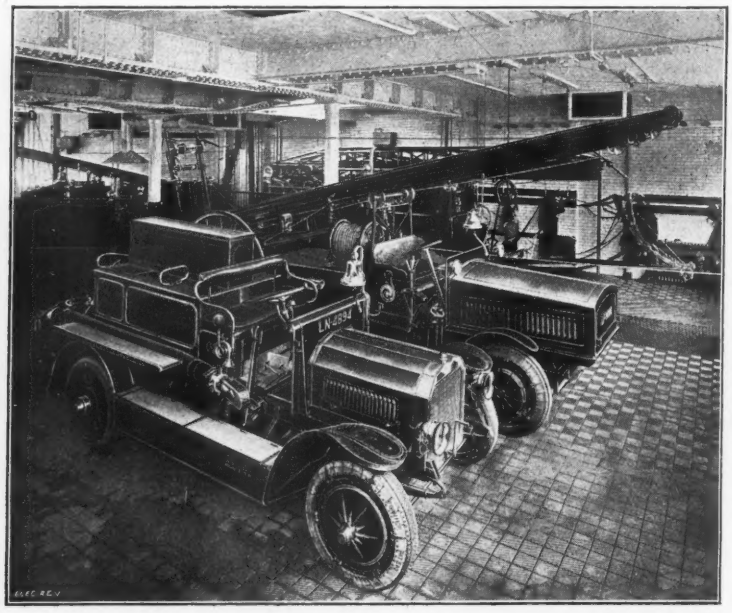
(*Concluded from page* 297).

The conditions of fire brigade work in London being entirely different to those existing in Berlin, it would be impossible to make any useful comparison with the running and maintenance costs of the vehicles in the German capital, as shown in our issue of August 14th, even if corresponding figures were available for the metropolis.

From the figures prepared last year by Mr. Dyer, we learn that the average annual cost of an electric escape van, under the heading of repairs to chassis and body, and tire renewals—the figures for each not being separately available—is £25. It may parenthetically be stated that so far the tire bill, owing to the relatively small mileage that has been covered, has been practically *nil*. Allowing £8 per annum for energy, and 3s. for oil and grease, the running and maintenance costs for an average mileage of 659 miles are £33 3s. per year. Taking the average first cost of the vehicle at £950, and spreading the depreciation over 10 years, plus interest on the outlay at 3½ per cent., there is an additional charge of £115 per annum, bringing the total costs per vehicle up to £148 3s. per year. This is Mr. Dyer's estimate of a year ago. At a meeting of the Institution of Electrical Engineers in March last, Lieut. Sladen, the Chief of the Brigade, put the annual cost of repairs, including battery renewals, at £40, which would increase Mr. Dyer's figure to £163 3s. Averaging, however, over the Brigade's whole fleet, the Chief considered that, taking into account the first cost, depreciation and maintenance, an electric escape-van and a petrol escape-van came out to practically the same running and maintenance cost, viz., £150 per annum.



Cedes Electric Motor Turntable Ladder, with Hub Motors in Front Wheels.



Interior of London Fire Brigade Station, Cannon Street, E.C.

Comparing these figures with the cost of horse-drawn escape-vans, it has first to be mentioned that the London Fire Brigade owns no horses, but hires them from contractors at an average rate of £70 per annum per horse, this figure including bedding, fodder and harness, and the contractor taking all risks. On this basis, and taking the average cost of a horse escape-van at £65, Mr. Dyer works out the annual cost as follows:—Depreciation spread over 25 years, and interest at 3½ per cent., £3 15s. 8d.; repairs, £9; two horses at £70, £140; total, £152 15s. 8d. Thus, from the financial point of view, leaving out of account the increased speed and efficiency, there is a saving in favour of the electrical vehicle.

In the course of our article on the Berlin Brigade, we pointed out the futility of endeavouring to work out the running and maintenance costs of fire brigade vehicles, whether horse-drawn, steam, petrol, or electric, on a so-much-per-mile basis, the prime factor of importance being that such vehicles must be constantly in full working order, ready to answer calls at any time—calls that may come several times in one day, after which there may not be another for several days—the only possible way of getting any idea of the possible mileage being to strike averages for previous periods. So far as experience has gone, the average of electric escape vans has been about 659 miles per annum—with minimum and maximum figures of 400 and 800 miles—and of petrol escape vans, roughly, 522 miles. It was because of the relatively small mileage that Lieut. Sladen was led to remark, at the Institution meeting already mentioned, that "It would perhaps be a shock to those who thought they could run electric vehicles cheaply, when he told them that the vehicles in use by the London County Council cost about 1s. 1·3d. per mile to maintain, and that did not include the driver's wages, first cost, or depreciation. But perhaps the feelings of those gentlemen who expected to hear something more favourable would be changed when he said that for similar petrol vehicles the cost was about 1s. 3d. per mile." The great point is that, whether the mileage be 600 miles per annum or even less, the vehicles are always ready to respond to a call, and that while they are more efficient than the old horse-drawn machines they have superseded, their annual cost is less.

On the point of efficiency, to those interested in electric vehicles it will be pleasant reading to learn that the officials of the London Brigade have no reason to regret the decision arrived at early in 1911 in favour of the adoption of electric escape vans and motor turn-table ladders. They report that among their advantages are the facts that the

vehicles can be driven by much less skilled men than are required for petrol or steam machines, and that from the point of view of rapidity of turn-out they are absolutely unequalled by any other form of traction. The vehicle starts off at a good speed, and, owing to its high rate of acceleration, quickly attains its top speed, while the others require time to get fully going. It is no uncommon thing for an electric escape van to turn out in seven or eight seconds, whereas, with other types of motor vehicles, the best time is 15 seconds. As the runs usually only average half a mile this is a matter of considerable importance. Another important point in favour of the electric vehicle is the electric braking as an addition to the ordinary mechanical brakes. We are also informed that the vehicles are very rarely held up for repairs, and that the cost of the same, apart from the batteries, is much lower than for petrol vehicles, there being no clutch or gear box, while the torque is even, so that there is but little wear on the working parts.

The following table shows the present actual number of motor vehicles—electric, petrol-electric, and petrol—owned by the London Fire Brigade, and the number still required to complete the conversion of the equipment.

	Present equipment of London Fire Brigade.	Still required to complete conversion of Brigade from horse to motor traction.
Electric escape vans	11	32
„ motor turn-table ladders	4	23
Escape vans, petrol or petrol-electric	22	31
Petrol or petrol-electric motor fire pumps	31	63
Motor lorries	3	8
Motor tenders	6	—
Motor canteen vans	—	1
Motor smoke-fighting vans...	1	—
Motor cars	15	—
Total	93	158

At the present time, out of the 85 stations of the London Brigade, 19 are entirely equipped with motor vehicles, and 11 partially so. New motor vehicles are, however, continually being ordered by the London County Council, and as the Brigade becomes more and more motorised, it is evident that London will not only be provided with a more efficient fire-fighting equipment, but that this will be controlled from fewer centres than has hitherto been found necessary. Thus, at a recent meeting of the London County Council the Fire Brigade Committee reported that the 12 motor fire engines and 12 escape vans, which are to be acquired during the current financial year, would shortly be delivered, and that arrangements could now be made for closing three sub stations—at Chelsea, Rushey Green and Sydenham. Tenders were also recently invited for the conversion of three horse-drawn turn-table ladders to electric traction.

From the foregoing it will be evident that the London Fire Brigade, so ably controlled by Lieutenant Sladen and his officers, has not merely kept abreast of the times, but is well in advance of the same, its equipment of motor fire-fighting vehicles being without a rival in any part of the world.

CINDER REMOVAL AT NEW YORK POWER STATIONS.

A series of interesting articles appeared recently in our contemporar, *Power*, describing the difficulties met with by the New York Edison Co. in connection with the discharge of cinders from the chimneys of its Waterside stations, and the means adopted to cure the trouble.

The problem of catching the cinders in the flue gases had confronted the authorities for many years, and the various schemes tried with a view to solving it included the precipitation of the cinders by reducing the velocity of the gases, which proved futile; the use of settling chambers, baffles, screens and water sprays; and, finally, high gas velocity, with sharp changes of direction of flow, and impingement on films of water, &c., which has proved effective.

The load conditions of the Waterside plants are very severe; in April, 1907, a 54,000-kw. rise occurred during one hour, and recently the stations took on nearly 52,000 kw. in 20 minutes, resulting in the forcing of fires, increased draughts and great production of small cinders. Close observation of the wind conditions showed that 75 per cent. of the cinders emitted from the chimneys was blown into the East River, and therefore less than one-quarter of the total fell in the inhabited area from which complaints arose.

With the intercepting arrangement in use now, about 95 per cent. of the solid matter is removed. At the Waterside No. 2 station boiler house, 48 650-h.p. boilers are installed on each of two floors; blocks of six boilers—three on either side—are coupled to sections of flues 50 ft. long, there being eight such horizontal flues on each floor. The boilers are equipped with Taylor stokers and operate with forced draught.

Figs. 1 and 2 show the apparatus in position, and fig. 3 shows diagrammatically a section of flue fitted with the cinder catcher, which has been patented jointly by Messrs. Murray and Grady, of the New York Edison Co.; in this A A are the smoke connections from the boilers to the flue B, which has a combined baffle and trough C extending the entire length. Fitting closely to this baffle is a large movable damper D, extending the length of the flue, and ordinarily allowing a gap of from 3 to 6 in. at E for the gases to pass through. The damper is counterbalanced by weights F, and when it is raised, the link G controls the movement of the lower edge, so that sufficient area for the passage of gases is maintained above the water in the bottom and between the damper and flue side.

An 8-in. water pipe, H, extends along each trough, perforated with 1 in. holes spaced 4 in. apart along the bottom; the water in the bottom of the flue is circulated through these pipes, filling the troughs and overflowing in a sheet down the baffles D, back again into the flue bottom. About 75 gallons of water per minute per boiler is circulated, and about 8 gallons per minute per boiler is added to make up for loss by evaporation, sprays, &c.

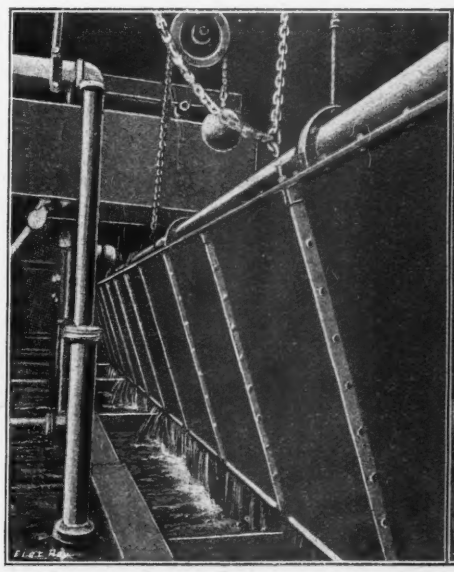


Fig. 1.—Damper and Flush Pipes.

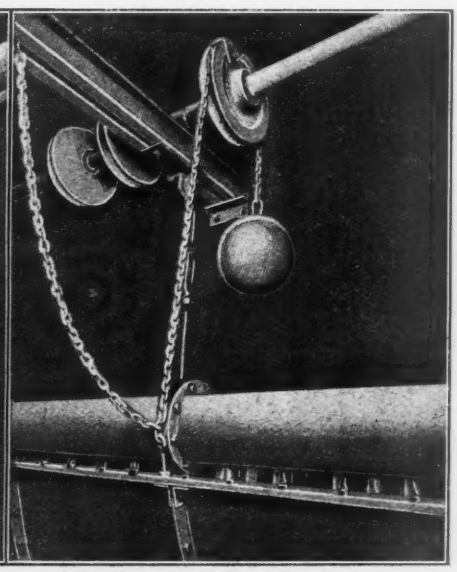


Fig. 2.—Weights and Water Main.

The gases coming through A are deflected downwards by C, impinging on the sheet of water on D, and then pass through the wedge-shaped duct at the flue side at high velocity on to the water in the flue bottom; from 10 to 15 per cent. of the cinder is taken out by the water on the damper, and from 80 to 85 per cent. is removed by the water in the flue. It is estimated that the cinder is projected towards the water surface at about 50 ft. per sec.

The boiler capacity is not seriously interfered with by the cinder catcher; the position of the baffle is maintained so that the velocity of the gases leaving the baffle is the highest possible with the chimney draught obtainable, and, under normal conditions, with boilers operating at 110 and 150 per cent. rating, the baffle

C

opening would be 3 to 6 in., increasing to 14 in. at 225 per cent rating.

The gases at the Waterside stations contain about '06 per cent. sulphur dioxide gas, and sulphurous and sulphuric acids are formed by contact with the water; the latter in the flue tank contains about '025 per cent. of those acids and a small amount of hydrochloric acid.

These acids have given much trouble; a sheet-iron baffle was eaten away in two weeks, and with enamelled sheets the enamel cracked off owing to the heat. Asbestos board became soft, and a wire-glass baffle failed as soon as installed. Up to the present No. 8 gauge copper baffles, flanged and fastened with ⅝-in. copper bolts, the ends reinforced with 2½-in. copper bar, have given the best results, no deterioration being shown on the side over which water runs, and very little on the other side after several weeks' service.

The flues of ⅜-in. steel plate are painted inside and out with linseed oil and red lead, and have a lead lining ⅛ in. thick in the bottom forming the water tank. These cinder catchers reduce the solid content of the gases to '02 gr. per cb. ft., which compares favourably with the scrubbers and washers used for cleaning blast furnace gas.

The apparatus was made by the Metropolitan Engineering Co., Brooklyn, N.Y., and has been applied at other stations.

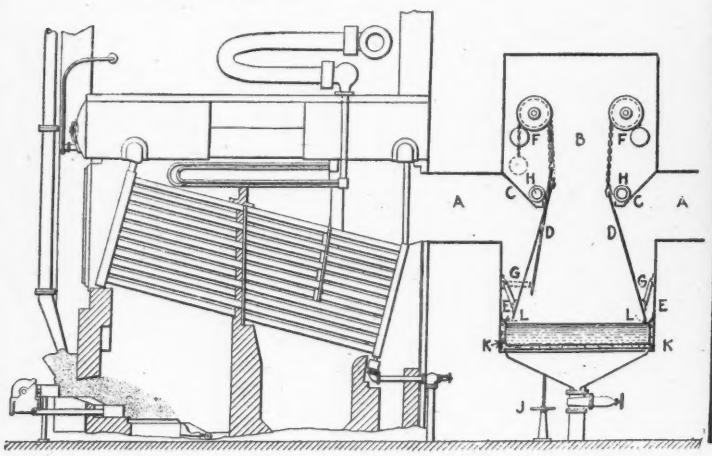


Fig. 3.—Section of Boiler and Cinder Catcher.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

An Electrically-driven Furnace-charging Machine.

A very interesting machine from the electrical as well as from the mechanical standpoint is the furnace-charging machine in a steel works, which lifts the charging boxes which have been previously filled with pig-iron or scrap and empties them into the furnace.

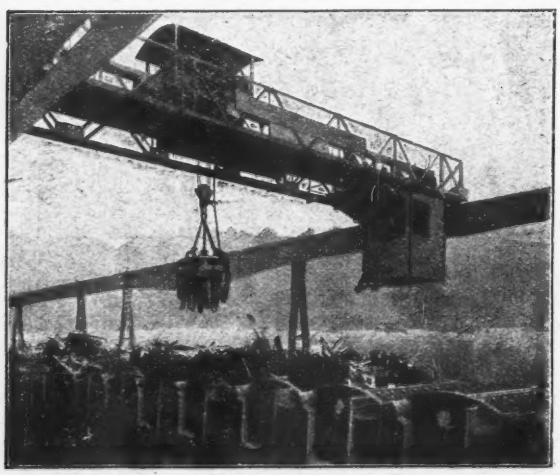


Fig. 1.—Charging Furnaces with Lifting Magnets.

A modern method of loading the charging boxes is by means of "Witton-Kramer" lifting magnets in the manner shown in fig. 1.

In fig. 2 a large horizontal steel bar may be seen on the left-hand side. This is carried by the charging machine and slides horizontally into sockets in the charging box. By slewing round the arm together with the box the charging machine traverses the length of the building, until it arrives opposite the particular furnace to be charged. The arm is then adjusted in height, and the box thrust into the furnace, upon which the bar is revolved through 180° and the contents emptied into the furnace. On the completion of this operation the bar is withdrawn, together with the emptying box, slewed round and the process repeated.

There are in all seven motions, and although the duty imposed upon the machine is heavy—the loaded charging box weighing as much as three tons—the motions are fairly slow, and motors of no great size are needed. The following gives the sizes of the motors and the speeds of the operation:—Hoisting, 20 H.P., at 40 ft. per min.; cross traverse, 40 H.P., at 220 ft. per min.; long travel, 60 H.P., at 300 ft. per min.; slewing, 10 H.P., at 6 revs. per min.; bar turning, 10 H.P., at 6 revs. per min.; auxiliary hoist, 10 H.P., at 20 ft. per min.; auxiliary traverse, 10 H.P., at 150 ft. per min.

Fig. 2.—Electrical Furnace-Charging Machine.

The charging machine illustrated was constructed by Messrs. Wellmann, Seaver & Head, of 47, Queen Victoria Street, London, E.C.; the motors were supplied by the General Electric Co., Ltd., of Witton, Birmingham, whilst the lifting magnet was manufactured by the Witton-Kramer Electric Tool and Hoist Co., for whom the General Electric Co., Ltd., are sole selling agents.

Sliding Contact Resistances.

The accompanying illustrations show one of the sliding contact resistances introduced by Messrs. Mickelwright, Ltd., of Well Works, Alperton, Middlesex. These resistances consist of a vitreous-enamelled steel tube, which is wound with high-temperature enamelled resistance wire. Contact is made on the wire with a laminated copper brush, guided on two rods, the latter ensuring that the brush shall not be over-strained. The regulation which may be obtained is very gradual and accurate. The apparatus is

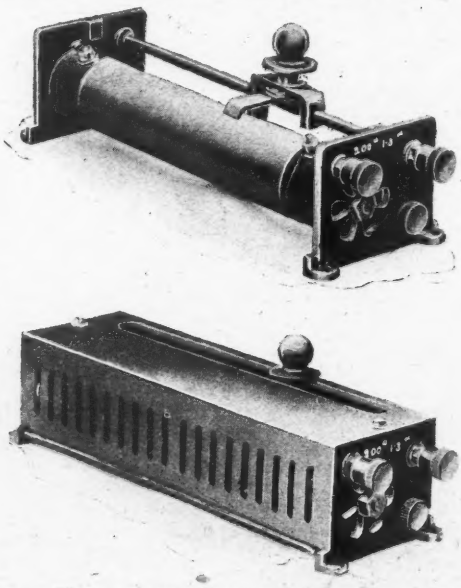


Fig. 3.—Micklewright Sliding Contact Resistance, with and without cover.

well ventilated, and light in weight, and all live parts are enclosed. The insulation is fireproof throughout, and the device is neat and compact in appearance. Six sizes are made, varying in capacity from 9½ amperes at 7½ ohms, to ½ ampere at 2,000 ohms. They are in use for the regulation of speed of small motors on kinematograph projectors, dimming lamps, testing, charging small cells, cautery, and similar purposes where fine regulation of small current is required.

Neutral Point Earthing Resistance.

Messrs. Ferguson, Pailin & Co., of Edward Street, Higher Openshaw, Manchester, have recently completed for the Bradford Corporation electricity department a neutral point earthing resistance, which we illustrate in fig. 4.

This resistance was built for the 6,600-volt three-phase system, and allows 500 amperes to pass to earth for three minutes without injury, the resistance being 8 ohms, so that the power dissipated is approximately 2,000 kw. for three minutes.

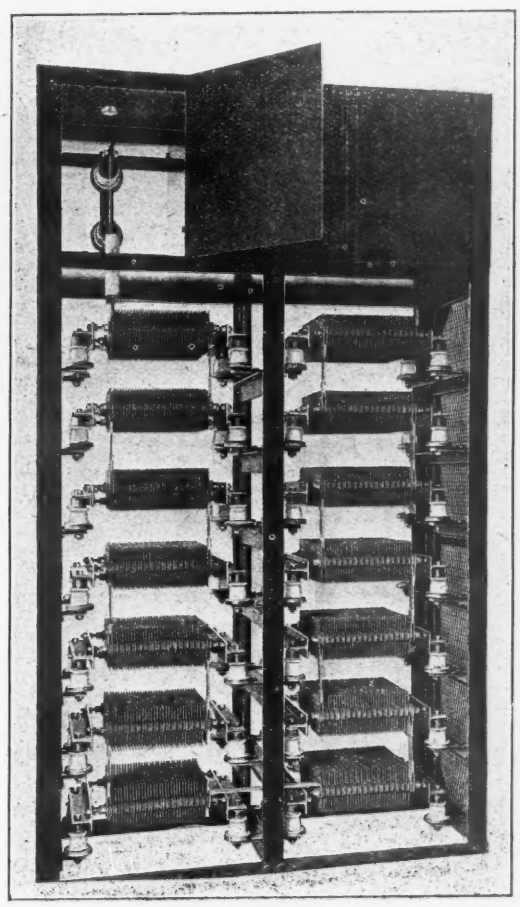


Fig. 4.—Neutral Point Earthing Resistance for Bradford Electricity Department.

The grids are of cast-iron and are supported on three mica insulated steel rods; the centre rod prevents buckling, a defect which many grids, supported in two places only, are subject to. Each bank of grids is carried on lengths of tee-iron, which are supported on porcelain insulators.

The insulation between grids consists of mica washers. The grids are slotted so that if it is required to replace any one of them it is only necessary to slacken the bolt and put in the spare grid.

The complete resistance is divided into halves which are placed in parallel, and isolating switches are provided at the top in completely enclosed chambers, for selecting the alternator to be earthed.

"Eye-Rest" Wall Bracket.

One of the latest applications of the B.T.H. "Eye-Rest" system of indirect lighting takes the form of ornamental wall-brackets carrying flambeaux, each of which is fitted with a small X-ray reflector and a 40-watt Mazda drawn-wire lamp; the light is thrown upon to the ceiling in the same way as with the ordinary bowl fitting. The lamps and reflectors are invisible from the ground. These brackets can be had in several period designs, with one, two, or three arms. Particulars can be had from the British Thomson-Houston Co., Ltd., Mazda House, 77, Upper Thames Street, London, E.C.

"Dim-a-lite."

The Wirt Co., of Germantown, Philadelphia, U.S.A., whose agents in this country are the Benjamin Electric, Ltd., 1A, Rosebery Avenue, London, have placed on the market a neat little dimming attachment, known as "Dim-a-lite," for use in conjunction with the glow lamp. It consists of a small rheostat which is inserted into the lampholder, while the lamp is fixed in a bayonet holder under the device; by pulling a small cord attached to it resistance steps are inserted and the light may be used either "full," "dim," "low," "night light," or may be put out.

The "Dim-a-lite" device is manufactured regularly for 110 and

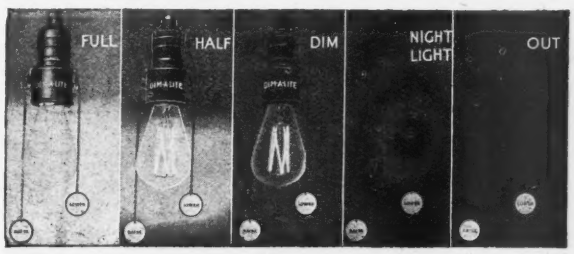


Fig. 5.—The "Dim-a-lite" in Use.

220-volt supply, either A.C. or D.C., and either of these types successfully operates with a range of pressures over and under those mentioned. The device is claimed to save from 20 to 70 per cent. in energy consumption, is easily attached and has been approved by the American Fire Underwriters. It can be fitted to a bracket lamp and operated by turning the shade if desired.

E.A.C. Ironclad Switchgear.

For the last 12 months the Electrical Apparatus Co., Ltd. of Vauxhall Works, South Lambeth Road, S.W., has been developing a new type of ironclad switchgear to comply with the new Mining Regulations, but at the same time to be of such a form that it can be used for central-station work where a more robust type of gear is required than the slate or marble panel type usually installed. Sample pillars are already working in some of the largest collieries in the country, and have proved satisfactory in service, so that the apparatus is already well past the shop

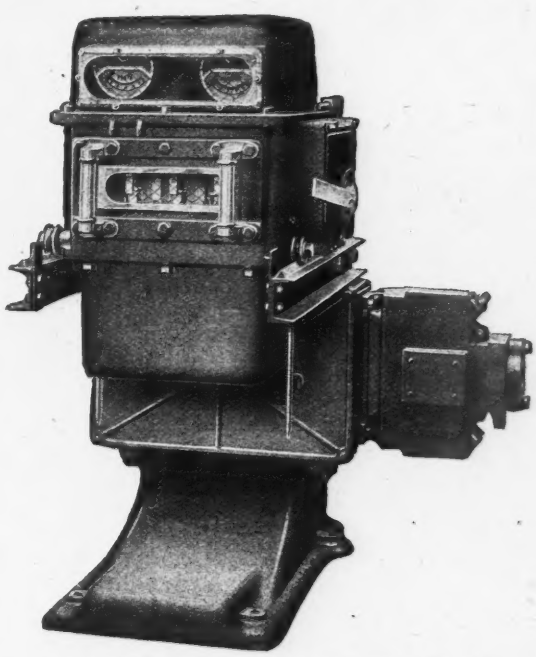


Fig. 6.—E.A.C. Ironclad Switch Pillar, Type C.

experimental stage. As shown in fig. 6, the whole of the electrical gear is contained in a cast-iron casing, no sheet steel being used for this purpose; the only exception is that two small inspection windows are fitted with thick wired glass; behind one of these the meters are mounted, and the other gives a view of the overload trip scales. The whole of the joints in the casing consist of broad machined faces 1½ in. wide which bed together without any packing; the gear may therefore be termed flameproof as well as oil immersed. The complete pillar is supported on a heavy cast-iron base, a portion of which forms a level stand immediately below the oil tank, so that the latter can be lowered directly on to this while inspection of the contacts, &c., is being made. Immediately above this pedestal is bolted the bus-bar and isolating switch chamber. This also carries rails on which the switch runs when being isolated. The bus-bars are of drawn copper rod, insulated throughout with mica. Connections from these bus-bars are made to three switch jaws above, with which the isolating plugs of the switch engage when the latter is

in position. Above these three jaws is a further set of jaws to which are connected feeder cables controlled by the switch. These isolating jaws are again insulated throughout by mica. The bus-bar and isolating chamber is covered by a removable cast-iron front having six holes, through which the switch isolating plugs pass, and a hinged cover for these is provided, on which are cast the words: "Danger. Close door when switch is away."

When in position the switch is supported on the rails mentioned above, and stands immediately in front of the isolating chamber. It is provided with rollers which make running easy; a 6,000-volt switch can easily be withdrawn from the isolating plugs by one man. While open air spaces inside have been avoided, ample room is provided for making adjustments and repairs, &c.

The insulation of the switch is mica throughout, even to the isolating plug connectors, which pass through the switch casing in a mica sleeve and are clamped to the case by a special packing gland. This is a great improvement over the usual method of cementing the connectors into porcelain insulators.

The switch contacts can be either of the laminated brush type with butt arcing tips bedding on to stationary copper blocks, or "V"-shaped solid copper contacts bedding on to laminated stationary contacts with arcing tips, as preferred. Either the "main" or "arcing" contacts can be removed without disturbing the others. The oil tank is wood lined, and wood separators are fitted between the phases. The overload trips are mounted directly on the main conductors, thus obviating the use of current transformers. Each trip is entirely independent of the others and of the no-voltage trip, but all operate on the same tripping bar. The overload trips are, of course, adjustable, and time lags can be fitted if desired. The arrangement of the trip gear is such that all trip coils can be fitted on to the load side of the switch; thus the no-voltage trip circuit is not broken on the isolating plugs. The tripping bar passes through the switch casing to a separate self-contained trip mechanism chamber on the right-hand side of the switch. This chamber contains no live parts, and is not interlocked with the other covers (see below); thus the tripping gear can be cleaned and adjusted without isolating or even opening the switch. The trip gear is loose handle, and a trip control lever is provided with "off" "automatic" and "non-automatic" positions. It can be left in the two former, but has a spring return to the automatic position from the non-automatic. If this trip lever is in the "off" position the switch cannot be closed, as it will trip before the switch contacts engage. The switch can be opened either by the trip control lever or by the main operating handle. The instruments are mounted inside the switch case, the voltmeter being provided with a reducing transformer and fuses on voltages above 650. The ammeter, like the overload trips, however, is mounted directly on the main conductors. Double interlocks are provided, that is to say, no portion of the switch casing (with the exception of the covers of the trip mechanism chamber mentioned above) can be removed if the isolating plugs are engaged, and the switch cannot be pushed back into the isolating chamber if any cover is off. These interlocks have purposely been placed in the most inaccessible positions so that they cannot be "fooled." The switch, of course, can only be withdrawn or placed in the isolating chamber if it is in the "off" position. The oil tank is provided with lowering screws. Arrangements are made so that the cables can be brought in or taken out in any direction.

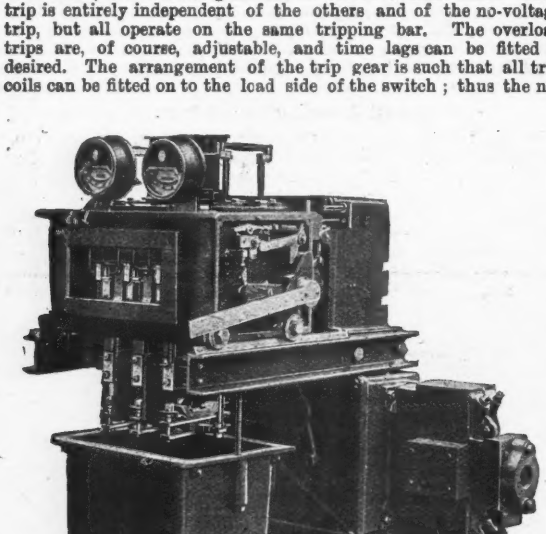


Fig. 7.—Ironclad Switch with Covers Removed.

The sizes at present placed on the market range up to 500 amperes on low pressure and up to 6,000 volts on high pressure.

A large stock of parts is being kept in order to effect prompt deliveries. The gear, although primarily for mining work, is suitable for the control of the high-pressure side of rotary converters, &c., in sub-stations.

Stamped Steel Pulleys.

Messrs. W. A. Walber & Co., of 38, Victoria Street, Westminster, send us particulars of their British "Keystone" all-steel stamped pulleys, of new design, which are guaranteed to run dead true on the shaft; the arms are fixed into the hub and rim in such a way that when the pulley is tightened up on the shaft the contour is not affected in any way. All the parts are carefully annealed. The bushes being of stamped steel are lighter than solid bushes, and are interchangeable, and the driving torque is distributed equally over all the arms. The pulleys are made in a great variety of sizes, from 6 in. in diameter × 3 in. wide, up to 30 in. × 9 in. wide, or 24 in. × 12 in. wide, the larger sizes being provided with double arms. No key-way is required.

WAR ITEMS.

Carbon Manufacture.—In view of the interesting position that the war has forced us into in connection with British-made carbons, it may not be out of place to remind our readers that at different periods during the last 30 or 40 years attempts have been made to carry on the manufacture of carbon rods for electric lighting purposes in this country. Though these efforts have had to be abandoned for various reasons, the matter possesses particular interest at the present time; it will be remembered that the owners of the Witton carbon works have incurred in connection with them during the past 12 years a loss of £70,000 or £80,000. Among the attempts referred to was that of the India-Rubber, Gutta-Percha and Telegraph Works Co., which dates back to 1878, and covered both carbon plates for battery purposes and carbons for lighting. The plant installed for the manufacture of these at that date is still in existence, and though devoted to the production of plates it could, no doubt, easily be brought into operation again if the market price of the product justified it. Some five or six years after the company began its carbon-making operations severe price-cutting was carried on by American firms, who, later, were themselves driven out of the field by the Austrian and German makers. Through all these years—very trying ones from the British point of view—the Silvertown company continued its operations with a diminishing output of carbons for lighting service. The remaining section of this class of the business disappeared in 1893, when British selling developments brought British as well as Continental price-cutting competition, and since then the factory has been devoted entirely to plates for batteries.

Names of Makers or Suppliers Wanted.—The Board of Trade have received a very large number of inquiries for names of sellers or buyers of articles of which the sources of supply or markets have been interfered with by the war. Special arrangements have been made in the Commercial Intelligence Branch of the Board (73, Basinghall Street, E.C.) for dealing with the inquiries, and lists are being prepared and circulated of articles which inquirers desire (*a*) to purchase and (*b*) to sell. The first lists are now ready and may be obtained on application to the Branch. Firms interested in any of the goods mentioned, either as buyers or sellers, should communicate with the director. An enlarged sample room will also be established very shortly for the purpose of exhibiting samples of German and Austrian or Hungarian goods or materials which have competed with British products at home or abroad, especially those which are necessary for the continuance of British manufacture, but which it is now impossible to obtain from their previous sources. Firms who may wish to exhibit goods are invited to make application to the Branch. It should be expressly understood, however, that the exhibition is intended exclusively for samples of goods which have formerly been obtained in Germany and Austria-Hungary alone, and which firms may now desire to purchase in the United Kingdom. Notice will be given of the opening of the exhibition. A catalogue library will also be opened, and firms who may not desire to exhibit samples are invited to furnish catalogues of goods formerly received by them from Germany and Austria-Hungary; these catalogues to be classified by trades in order to be readily accessible to inquirers.

In the list of articles which inquirers desire to purchase the following appear:—

Aluminium—Disks; powder; rods and sheets.
Asbestos—Fibre jointing.
Brassware—General.
China and earthenware—For electric fittings.
Electrical apparatus—Celluloid cases; enamelled copper wire; magnets; magnetos; papier maché covers; vulcanite mouldings.
Fibre—Board.
Glass and Glassware, General—Blown glass; for electrical fittings; for optical instruments; heat-resisting.
Lamps—Carbons for; electric incandescent; globes for; glass bulbs and tubes for.
Lighters—Automatic.
Machinery for making electric lamps.
Paper—For Morse telegraphy.
Rubber—Thin gutta-percha.
Sheet Metal—Aluminium; brass; iron plates; zinc.
Vulcanite—Mouldings; rods and sheets.
Wire—Enamelled copper.

JAPAN.—The Board of Trade has received the following information from H.M. Commercial Attaché in Japan:—"Chiefly owing to rapid buying the consequent rise in prices of accumulated stocks, and the special conditions resulting therefrom, payments have improved. The financial position is said to be fairly satisfactory, but it is difficult to say precisely whether regular payments will be possible in the event of the market becoming congested. H.M. Commercial Attaché is of opinion that the German Empire's large share of the trade is almost entirely due to excessive credit facilities, and although (presumably under ordinary circumstances) he would not consider such a course desirable, it may be necessary for British interests to extend credit facilities. Export trade is seriously disorganised owing to the stoppage of Continental purchases of silk and the big fall in prices in the United States. Transactions in habutae, braids, and in general export trade, are being very much interfered with on account of serious difficulties as to shipment and exchange, but the present position is slowly improving on account of assistance promised by the Japanese specie banks. Prospects for the rice crop are encouraging. The following are German or Austro-Hungarian goods with which British manufacturing interests should be able to compete:—Drugs (especially); galvanised iron wire, worsted yarns and electrical machinery. The iron and steel supply is calculated to suffice for six months; wire gauge No. 8 has advanced to £9 15s. c.i.f., and other gauges in the same proportion. Mild steel bars, round, basis sizes, have advanced by, roughly, 40 per cent., and sheets in the same proportion. The above prices are for stocks, and there is no forward business being carried on. There has been a very large rise in the price of drugs, especially santoninum, acid carbolicum, cocaine hydrochlor, morphia, German proprietary medicines. British manufacturing interests are strongly recommended to take advantage of the opportunity which must offer for the supply of enemies' goods, but it is absolutely essential that experts should pay a visit to Japan. The present stock of yarns is believed to be small, on account of the depression in the mousseline trade early in the year. There has been a 20 per cent. rise in prices of paper owing to the shortage in the supply of pulp and other necessaries for its manufacture. Domestic pulp is only suitable for newspapers. There has been no change of importance in the textile import trade. No better opportunity is likely to occur for the supply of dyes and malt if supplies are forthcoming. There has been a big rise in price of industrial chemicals and glass sheets. The greatest energy is being displayed by American firms, and Japanese firms will also take advantage of the opportunity."

LANCASHIRE NOTES.—Mr. Webber, who is connected with a large North of England firm interested in the sale of electric lamps and other lighting goods, was one of the chief speakers at a meeting of business men and publicity men which was held at the Grand Hotel, Manchester, on August 28th, for the purpose of discussing the business conditions and trading possibilities arising out of the war. The meeting had been convened by the Column Club, which embraces in its membership business men of all kinds and advertising men.

Mr. Webber said that his firm had been largely interested in the importation of German and Austrian goods into this country. Immediately after war broke out foreign supplies were cut off, and they were faced with the possibility of having to close down their business entirely. They were wanting supplies of a certain article, and he wrote to the firms in this country who were manufacturers in that line of business. There were six firms only, and five replied "full up." The sixth firm replied to the effect that they would be pleased to supply any sort or make of the article required. The quotation he afterwards received was 10 guineas per gross. The German price was 14s. per gross. ("Oh!") Manufacturers in this country, said Mr. Webber, were far too conservative. An instance of this was to be found in an experience which he had just had. He wrote to a large Birmingham firm from whom he wanted glass to replace the Austrian glass which, up to the present, had been reputed to be the best in the world for use in connection with lighting. The Birmingham firm said they would quote, and they did so. He offered them a big order, and received from them a reply that they were "full up," and that to fulfil the order would necessitate the manufacture of a special mould and special machinery, and they did not see fit to entertain the proposal. His reply to that was that he would be pleased to pay for the mould and the cost of producing the necessary machinery. The firm said they could not entertain it. Personally, he thought it was a great shame. Germans had come over to this country with nothing but a satchel, had stayed a short time, paying no taxes, and had gone back with orders amounting to hundreds of thousands of pounds, which had kept their workshops busily employed and found work for hundreds of people. In his opinion the best service the Column Club could render to the people of this country would be to invite capitalists and manufacturers to be more broad-minded and to lay themselves out to supply the needs of this country and of the Colonies by opening up factories and making goods which had formerly been made only in Germany and Austria. Banking institutions might be prevailed upon to assist such projects. He was convinced that if that policy were adopted they would have a walk-over, because they had a good start.

The Chairman (Mr. W. H. Veno) presented a long list representing a summary of the value of electrical imports from Germany during 1912 retained in this country. He moved the following resolution:—"That this meeting considers there is now no real basis for any panic in business. Home demand in a large degree still continues; all Colonial and many foreign markets are open to us. Britain's ultimate success can best be gained by a return to normal conditions of trade, and to help to secure this end manufacturers of branded goods are urged to continue their advertising both at home and abroad, especially having regard to the many opportunities there are at present of securing trade which has hitherto gone to Germany and Austria."

Mr. S. C. Peacock, who seconded the resolution, said that the worst had happened, business men now knew how they stood, and he calculated that within a month the business which would be done would be 90 per cent. of the normal.

The resolution was adopted, and it was decided that a committee should take steps to give practical effect to the resolution, and to secure the co-operation of the Press.

The Stalybridge Joint Tramways and Electricity Board has decided to pay half wages (minimum 10s.) to men in the service of the board who join the colours, and to keep their situations open for them.

The St. Helens Cable Co. have lost the services of 22 employés who have been called up, and the company are looking after their dependants and keeping their situations open. The works are running full time, and it is not anticipated that any difficulty will be experienced in keeping them going.

At the next meeting of the Bolton Town Council one of the members is to move a resolution that the salaries of all Corporation servants receiving over £100 per annum be reduced according to a scale commencing with a reduction of 5 per cent. on the first £100, and rising to 25 per cent. on amounts over £500.

The staff of Darwen electricity and destructor departments have decided upon a weekly voluntary levy to be given to the relief fund, the scale to be:—Those receiving wages of 20s. and under 30s., 6d. per week; 30s. and under 40s., 9d.; 40s. and under 50s., 1s.; 50s. and under 60s., 1s. 3d. Councillor Thornley (Electricity chairman) will contribute 5s. per week; and Mr. Garnett, manager, 4s. 6d. per week.

Our Manchester correspondent writes:—"The British Westinghouse works at Trafford Park, Manchester, are running full time, and the staff have decided to make a donation to the relief fund, made up of a certain proportion of their salaries, which will amount to about £800. Electricity and tramway employés in the service of the Manchester, Salford, Blackburn, Oldham, Darwen, Wigan, Rochdale, Hyde, and Stockport Corporations have decided to support the national relief fund, either by way of voluntary levies of proportions of their salaries and wages, or by weekly collections. By permission of the B.I. and Helsby Cable Co., the Recreation Hall at Helsby is being converted into a hospital for the Red Cross Society. Messrs. E. O. Walker & Co., of 26, Cannon Street, Manchester, who installed the electric lighting for the rifle range of the Hollins Mill Co., Ltd., have generously offered to fit up, free of cost, one or two others on similar lines, if someone else will find the room."

AUSTRALIA.—H.M. Trade Commissioner in Australia, under instructions from the Board of Trade, has recently collected certain samples of foreign hardware, hollow-ware, and tools which compete with similar goods of British origin in the Australian market. These samples, which include a large number of German goods, have just been received from Australia, and in connection with the campaign which the Board of Trade has recently started with a view to assisting British firms to secure trade formerly in German and Austro-Hungarian hands, arrangements have been made for their immediate exhibition in this country. The samples, which number about 430, divide themselves into the following main headings:—Aluminium ware, enamelled ware, general hardware (bolts, staples, hinges, butts, bells, choppers, hooks, padlocks, stoves, lamps, spoons, &c.) and tools. The aluminium ware, enamelled ware and general hardware have been dispatched to Birmingham for exhibition at the offices of the Birmingham Chamber of Commerce, and the tools to Sheffield for exhibition at the offices of the Sheffield Chamber of Commerce. All the samples will then be exhibited in London and in any other industrial centres where it may seem desirable to send them.

A report relating to these samples, giving full information as to country of origin, prices, &c., is being circulated to firms in the country who may be interested, and copies may also be obtained on application at the offices of the Commercial Intelligence Branch, 73, Basinghall Street, London, E.C.

The employés of the Edison & Swan United Electric Light Co., Ltd., have joined almost in a body the rifle club formed by the company, in which the directors have interested themselves in more ways than one.

BELGIAN IRON AND STEEL WORKS.—The *Practical Engineer* states that during the Liége bombardment the Ougrée-Marihaye Steel Works at Liége are reported to have been demolished, and the Cockerill works at Seraing partially so. The Cockerill works employ 10,000 workmen, and large number of turrets have been turned out for Belgian forts, the special steel of which is about 9 in. thick, of tremendous strength, and owes it great defensive powers largely to the curving, produced by hydraulic pressure. Recently, the firm produced turrets for the Antwerp forts, while Fort Seraing, recently attacked by the Germans, was equipped from these works. One of the lathes for dealing with these turrets has a span of 35 ft. The firm built the first locomotive, manufactured the first steel rails produced on the Continent, and for many years was the leading establishment in Europe in output and number of workmen employed. The chief, Dr. Adophe Greiner, was in May last elected president of the Iron and Steel Institute, and would have presided at the Paris meeting in September. In 1897 Dr. Greiner installed at Seraing the first gas engine driven by cleaned blast furnace gas, and this engine is still in use. The Germans have seized the works and are trying to carry them on, but cannot get workmen. The Ougrée-Marihaye works cover 264 acres, and comprise 60 coke ovens, eight blast furnaces, and a steel-producing plant covering 91 acres, and turning out nearly three-quarters of a

million tons of steel annually for railways, bridges and all sorts of structures, and the firm employ at least 12,000 workmen.

Change of Name.—Messrs. A. W. & A. G. Oppenheimer, directors of Messrs. Hick-Diesel Oil Engines, Ltd., both of whom are British-born subjects, have adopted the surname of Fowler in place of Oppenheimer.

An "All-British" Directory.—The British Engineers' Association has issued the second edition of its Official Directory. The objects of the Association are already very fully known to our readers. The combined capital of the firms on its membership roll amounts to about £100,000,000, and it is stated that the members between them cover the whole range of engineering plant and accessories. This Directory gives a list of firms who are members, and it also contains a full classification of these members according to manufactures. From the paucity of entries under some of these classes one is persuaded that there are a good many British electrical manufacturers who have not yet seen the wisdom, or else the necessity, for joining this organisation. Obviously they must have their own reasons, for we have given the work of the Association sufficient publicity in our pages to keep it well before them. The offices of the Association are at 32, Victoria Street, S.W.

British Thomson-Houston Co., Ltd.—The company estimated that some 200 of their men from the shops and staff would enlist, but so prompt have been the answers to the call, that instead of 200 the number from the staff and works is well beyond 400 to date. This is over 10 per cent. of the adult male employés, there being a large proportion of women employés in the lamp factory.

Joint Box Compound.—The Dussek Bitumen Co. have been asked if they anticipate any difficulty in obtaining supplies of the raw material used in connection with the manufacture of their "Trinidite" joint box compound, and as a large number of engineers are at the present time employing "Trinidite," the company wish to state that they hold stocks sufficient to ensure deliveries for 18 months or more. Shipments of further raw material are coming to hand from the Colonies, so that there will be no interruption whatever in the manufacture or supply of their materials. "Trinidite" compound is used by the Admiralty on board battleships and in other important situations.

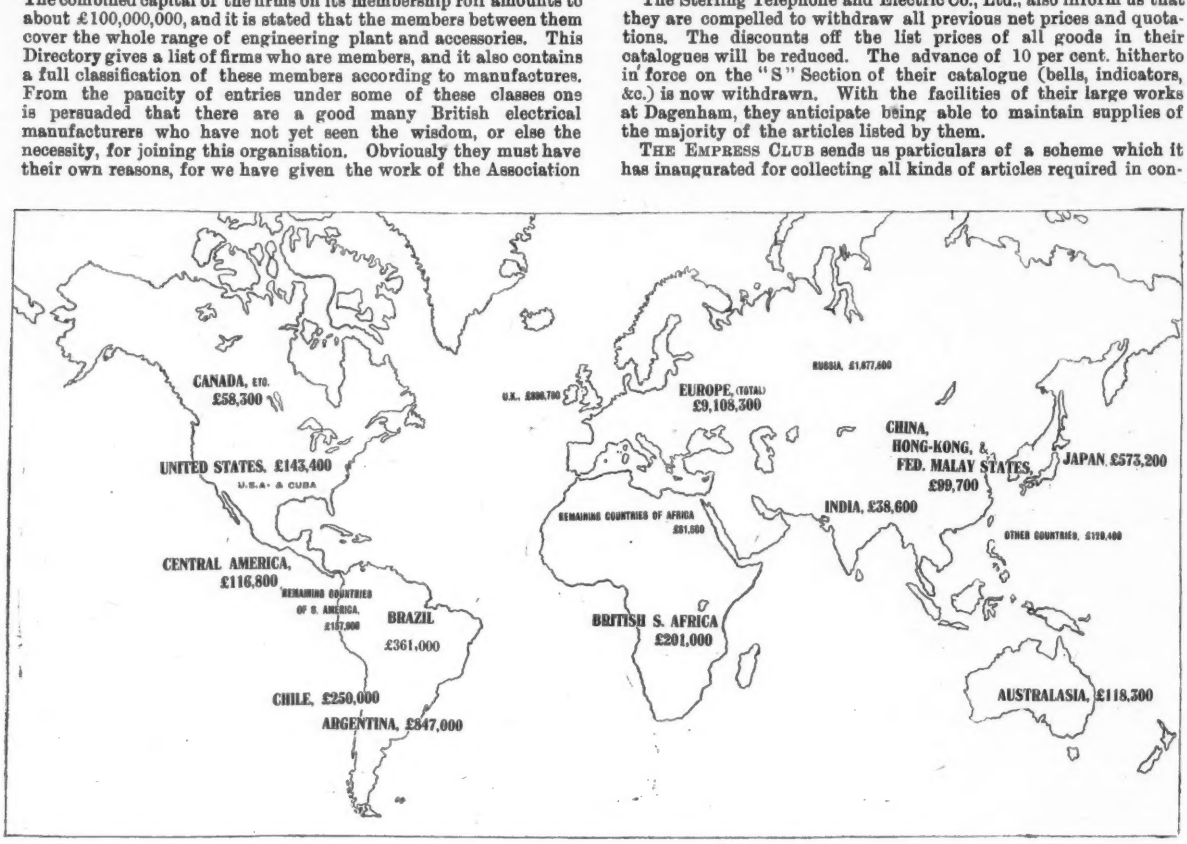
Telephones and Telephone Accessories.—The Adnil Electric Co., Ltd., announce that in consequence of the great advance in the price of all raw materials and the unsettled state of the markets generally, they are compelled to withdraw all net prices and previous quotations, and to reduce the discounts off the list prices of all goods in their telephone catalogues. Their future stocks of telephones and signalling apparatus, including their well-known mining material, will be of British manufacture throughout; the manufacture is well in hand, and they do not anticipate any undue delay in the execution of orders.

The Sterling Telephone and Electric Co., Ltd., also inform us that they are compelled to withdraw all previous net prices and quotations. The discounts off the list prices of all goods in their catalogues will be reduced. The advance of 10 per cent. hitherto in force on the "S" Section of their catalogue (bells, indicators, &c.) is now withdrawn. With the facilities of their large works at Dagenham, they anticipate being able to maintain supplies of the majority of the articles listed by them.

The Empress Club sends us particulars of a scheme which it has inaugurated for collecting all kinds of articles required in connection with Red Cross aid in time of war, including clothing, linen, games, medical appliances, &c. Address the Hon. Secretary, Emergency Voluntary Aid Committee, the Empress Club, 15, Berkeley Street, W.

Not a German Firm.—Messrs. Julius Sax & Co., Ltd., write as follows:—

"On several occasions recently it has been suggested that we are a German firm, and we should like an opportunity of correcting this entirely erroneous impression, and stating that the firm is capitalised and worked by Britishers. The original founder, Mr. Julius Sax, M.I.E.E., who died in 1890, was born in Russia in 1828, and came to London in 1851. Soon after this date he started the present business, and amongst other things invented the fire alarm system which is still being used in Metropolitan Fire Brigade stations. Since the establishment of the firm, over half a century ago, a number of specialised lines have been added to its manufactures, and in every instance materials and labour are entirely British. As we do not rely on the Continental markets for parts or raw materials, we are in a favourable position to fulfil those orders which have previously been placed with agents for German goods."



Principal Electrical Markets of Germany, Showing the Total Value of Exports of Electrical Goods from Germany in 1912.

To Europe—	
United Kingdom	£880,700
Norway	345,400
Sweden	454,000
Denmark	322,600
Holland	591,600
Belgium	761,300
France	493,500
Spain	523,000
Portugal	62,100
Italy	898,200
Switzerland	395,500
Austria	1,062,700
Bulgaria	20,900
Servia	21,200
Roumania	168,800
Greece	22,200
Montenegro	600
Turkey	44,800
Russia	1,877,500
Finland	140,800
Gibraltar, Malta and Cyprus	900
	£9,108,300

To America—	
United States	£116,400
Canada	55,000
Mexico	105,000
Panama	1,500
Salvador	800
Nicaragua	250
Honduras	750
Guatemala	5,800
Costa Rica	2,700
Argentine	847,000
Brazil	361,000
Chile	250,000
Uruguay	116,000
Bolivia	12 000
Peru	16,000
Colombia	7,000
Ecuador	2,600
Venezuela	2,600
Paraguay	1,700
Cuba	27,000
Br. W. Indies and Newfoundland	3,300
Other	900
	£ ,934,400

To Africa—	
British South Africa	£201,000
Egypt	26,800
German S.W. Africa	8,200
German E. Africa	5,800
Portuguese E. Africa	5,300
Morocco	4,000
Spanish Africa	2,600
British W. Africa	2,500
Cameroons	1,900
Tunis	1,000
Togo	1,000
Brit. E. Africa	800
Other Africa	1,600
	£262,500

To Australasia—	
Australia	£101,800
New Zealand	8,600
German New Guinea	7,800
Other	100
	£118,300

To Asia—	
Japan	£573,200
China	96,000
British India	38,600
Dutch E. Indies	93,700
Siam	10,700
Phillipines	6,100
Kiao Chau	4,300
Ceylon	2,700
Corea	2,400
Straits Settlements	1,900
Hong Kong	1,800
Other Asia	500
	£831,900

Summary.	
To Europe	£9,108,300
„ Africa	262,500
„ Asia	831,900
„ America	1,934,400
„ Australasia	118,300
	£12,255,400

The Safetee Controlling Appliances Co., Ltd., inform us that they are working their usual hours, and will continue to do so. They have large stocks of all sizes of their standard types of combined switch fuses, and are prepared to quote for any other type of switchgear for all purposes. They have a complete range of combined switch fuses made to Admiralty specifications, which can be dispatched in a day or so. Their other specialities are complete starting panels and all types of switchboards.

The Iron and Steel Institute.—The Secretary informs us that the Comité des Forges de France has been obliged to cancel all arrangements for an autumn meeting of the Institute in France this year. Under the circumstances, the Council has decided that it would be advisable to postpone for the present the organisation of any alternative arrangements for an autumn meeting for the reading and discussion of papers. A number of papers have been submitted with a view to their presentation at the meeting which was to have been held at Paris, and the Council proposes to print in the usual way advance copies of those papers approved for publication and to invite discussion thereon by correspondence. It is expected that the copies will be ready for issue about the second week in September. Members who desire to send in written communications in discussion of any of the papers can be supplied with copies of those in which they are interested on application to the Secretary. The papers and correspondence thereon will be published in the next number of the Journal.

The Council express their most sincere sympathy with their President, Mr. Adolphe Greiner, and his family in the great anxieties under which they are at present suffering, in common with his countrymen, at whose hands the Institute experienced such kindly hospitality in the autumn of last year.

The following is the list of papers that have been submitted :—

E. D. Campbell, "Note on the theory of hardening and on the constitution of steel."
G. S. Cooper, "By-product coking industry and its relation to the manufacture of iron and steel.
L. Dufty, "Determination of cobalt in high-speed steels."
L. Guillet, "Electrolytic iron, its manufacture, properties and uses."
G. Hailstone, "Transverse testing of cast-iron."
W. L. Johnson, "Utilisation of heat contained in slags."
N. G. Kapp, "Mechanical charging of blast-furnaces."
P. Nicou, "Iron ore deposits of Lorraine and the West of France."
H. de Nolly and M. Veyret, "The transformations of steels."
J. A. Pickard and F. M. Potter, "Oxygen content of open-hearth steel."
A. M. Portevin, "Decarburisation of the steels in salt hardening baths."
A. M. Portevin and V. Bernard, "Influence of coalescence on mechanical properties of steels and alloys."
A. Sahlin, "Use of liquid ferro-manganese in the steel processes."
A. Spannagel, "New process for heating blast-furnace stoves."

A Compleat Englishman.—Mr. Justus Eck writes as follows :—"In the interest of my colleagues and those who serve with me on Boards, Councils and Committees, it has been suggested that I should make it clear that, although my grandfather was a Russian, my father was naturalised an Englishman in 1850, while I was not only born in London, but also educated at King's College School, University College, and the Cambridge University. My whole business career has been in Great Britain, with the exception of short periods with British Colonies and Italy. Quite a number of my relations are serving with his Majesty's colours, both with and without commissions.

"I should not have troubled you with the above had not organised trade competitors endeavoured to harm the interests of the organisations with which I am connected, and I wish, therefore, to state that every employé of the Union Electric Co., Ltd., during the 14 years of its existence has been, and is, a British-born subject (with the exception of a Dutch stenographer, whose appointment was due to her competency in English orthography and stenography, and three young men, two of whom stayed under six months ; the third, who stayed longer, left ten years ago), and the same applies to the majority of the board of directors.

"Deeply as we all feel the sufferings imposed on our land and its brave defenders, by this insane outbreak of German militancy, I am sure no Englishman desires to take any unfair advantage due to the trade disturbance, and I for one would be very sorry to impose any hardships on any honest Austrian or German resident here, who had hitherto lived amongst us a friend and conscientiously carried out his duties.

"I see very many names of German origin amongst the officers and past Presidents of the Institution of Electrical Engineers ; were they placed there for other than their good work for British electrical engineering ?

"Finally, many Britishers may, like myself, have to thank business acquaintances in Germany or Austria for their present care of loved ones ; should we show ourselves less noble ?"

Chloride Co. Assist Recruiting.—The Chloride Electrical Storage Co., Ltd., of Pendlebury, Manchester, have posted the following notice up in their works :—

"The directors of the Chloride Electrical Storage Co., Ltd., consider that the best and most immediate service they can render to the country in the present time of national stress and emergency, is to facilitate as far as is in their power response from employés of the company to Lord Kitchener's appeal for recruits for the second army. They have accordingly resolved—

"1. To grant to the dependants of married men enlisting an allowance of 10s. a week to the wife from the date of acceptance and to continue until the war is ended, together with a further allowance according to circumstances for children.

"2. In case of unmarried men with dependants to grant an allowance which will be settled according to circumstances.

"3. In addition, in all cases whether married or single, to give to every employé who enlists and is accepted, the sum of £5, to be paid in such way and at such times as the works manager may think fit, under the circumstances of each particular case.

"4. The directors will treat in the same spirit all applications for re-employment on return."

Street Lighting.—Municipal authorities are acting patriotically during the existing crisis not only by refusing to curtail work in progress, but also by undertaking work which is necessary but which is not immediately urgent. The Electric Street Lighting Apparatus Co., whose business is largely among these authorities, have received a number of such orders for street lighting fittings, the most important being from West Ham and Battersea, and this despite the fact that the increased price of raw materials has added somewhat to the cost. In addition, the orders received in connection with Admiralty and War Office work have enabled the company to employ a greater amount of labour beyond that necessary to replace the large percentage who were mobilised and who were called away to assist in the Admiralty repair shops.

"As Usual."—Messrs. C. Jennings & Co., timber importers, of Bristol, state that they are giving the usual credit terms on both old and new accounts. They are endeavouring to keep the whole of the works going, and are trying to catch the spirit of the times and start the manufacture of new lines of woodwork that were previously foreign.

Cables for Edinburgh.—The Corporation some time ago placed a contract for cables for extensions with the agent of a German firm. As that contract cannot now be fulfilled, the E.L. Committee has turned to a home firm, the British Insulated and Helsby Cables, Ltd., and placed the order with them.

German Brass Trade.—One of the series of special memoranda issued by the Commercial Intelligence Department of the Board of Trade, for the assistance of British firms, gives full statistical and other information respecting the German and Austro-Hungarian export trade in brass and brass wares, &c.

Another similar publication details the German and Austrian exports of machinery belting, of leather, wool, cotton, or other materials, with observations on the position in the neutral markets.

L.C.C. Tramway Employes.—At a representative meeting of all grades among the 12,000 employés of the London County Council Tramways Department, presided over by Mr. A. L. C. Fell, the manager, a scheme to contribute to the Prince of Wales's National Relief Fund was decided upon. It was agreed that the men should be invited to state on specified forms what weekly sum they would be willing to contribute. Subscribing is purely voluntary and the amount optional.—*The Times.*

English Electrical Employes in Berlin.—A communication dated August 18th has been received by *The Daily Mail* stating that the Allgemeine Elektricitäts Gesellschaft was treating well its British employés, who include 19 men and 11 women.

City and Guilds Technological Examinations.—The City and Guilds of London Institute has issued a notice stating that students of technological classes and others preparing for any of the examinations of the Institute's Department of Technology will not, so far as possible, be prejudiced in competition for certificates and prizes, if they have been prevented from fulfilling the Institute's regulations as to attendance at classes or otherwise, by reason of their having joined the military forces of the Crown, or having accepted temporary civil employment in connection with the defence of the country.

Government Orders.—The works of the Aster Engineering Co. (1913), Ltd., at Wembley, are working at high pressure, having a number of orders in hand for H.M. Government. Time and a-half is being worked in nearly all departments, and some 50 extra hands have been taken on during the past fortnight.

The British Electric Calibrated Fuse Co. inform us that they are exceedingly busy with Government orders, and also that their commercial orders show no signs of falling off up to the present. They have adopted the policy of taking on as many new hands as possible, so as to give the maximum amount of employment. They are in a position to execute orders promptly for any type of fuse (except where porcelain is employed), and in a great number of cases, where at present porcelain fuses are in use, they can supply other forms of fuses for the same terminals, as they have already done. A number of strip and glass barrel fuses, slate fuse bases, &c., were previously made in Germany ; these can be supplied, made from British materials in their entirely British works. Prices are the same as usual, except where they themselves have to pay more for raw materials ; but, by their policy of carrying large stocks, this is not often the case. The employés are making a weekly subscription to the Prince of Wales's Relief Fund, and the firm are doubling the total amount received.

Commandeered Chassis.—The Manchester Corporation motor-bus services from Palatine Road to Cheadle and Northenden, which had to be discontinued because the military authorities commandeered the chassis, have now been resumed, the Tramways Committee having got some chassis on loan from the London General Omnibus Co.

The Prince's Relief Fund.—The boxes on Manchester tramcars, into which passengers drop their tickets upon leaving, have been converted into collecting boxes for the National Relief Fund.

British Firms Now.—The *Financial News* states that the Port of London Authority placed contracts just before the war with three German firms to the extent of £250,000 for two pairs of lock gates, a caisson swing bridge, a bascule bridge, and five locomotives for the new Albert Dock, the India, and the Millwall Docks. Tenders have now been invited from English firms for all this work.

Alien Control of Companies.—In the House of Commons, on Monday (according to the *Financial News*), Mr. Joynson-Hicks asked the President of the Board of Trade whether he was aware that Messrs. Siemens Brothers, under the title of the Siemens Dynamo Works, Ltd., were announcing publicly that they had received a contract to supply the British Government with electric

lamps for the ensuing 12 months; and whether he was aware that though this business was registered in England as a limited company with £600,000 capital in 120,000 shares, these shares were largely the property of alien enemies, 70,465 being held by Arnold W. von Siemens, Karl von Siemens, and George von Siemens, all of Berlin, 19,783 by Alexander von Siemens, and 19,210 by G. von Chauvin, who was registered here as an alien enemy; and other blocks of shares were held by persons with German names, thus ensuring that practically the whole of the profits on such Government contracts, and other orders for cables, &c., which had been given by his Majesty's Government to this firm would, in the ordinary course, accrue to the advantage of these alien enemies; and whether he would take steps to ensure that a receiver be immediately appointed, so that while the plant and factories were used for the production of articles required in this country, so that British workmen should not be thrown out of work, there should be no profits sent during the currency of the war to the King's enemies.

Mr. Runciman: I think the best answer I can give to the hon. member is to assure him that the general question of the position of limited companies in this country which are controlled by alien enemies is at the present time receiving the most careful consideration of his Majesty's Government. I cannot say more at present.

Swedes.—The Swedish Government has issued a proclamation forbidding the exportation of "accumulators, mounted or partly mounted, elements or batteries," during the period of the war.

Marble Scarcity.—In view of the scarcity of marble, Messrs. John Williams & Co., Dinorwic Slate Wharf, Rotherhithe Street, S.E., announce that they have a large stock of slate for switchboard purposes.

For the Front.—The services of Trooper Frank A. Blood, 6th Dragoon Guards, Reserve Regiment, have been accepted by the authorities. On his return from the South African War in 1903, he rejoined the B.T.H. Co. at Rugby, afterwards joining Messrs. Ferranti, Ltd., as their assistant superintendent of switchgear erection in London and the South of England. At the time of rejoining his regiment he was the Liverpool and district representative for Messrs. Crowther & Osborn, and the Sceando Lamp Co., Ltd., of Blackfriars Street, Manchester. The regiment has been warned to be in readiness to leave for the front at any moment.

Recruiting.—Messrs. Eckstein, Heap & Co., Ltd., manufacturing electrical engineers, of Manchester, have expressed the hope that all their employés who are fit to assist the country will take advantage of an offer they make to pay grants of money weekly to wives or parents of their employés who enlist. The grants are to continue from the day an employé is accepted for service to the conclusion of the war.

Down to Wednesday morning 75 employés of all grades from the generation and distribution departments staff of the County of London Electric Supply Co., Ltd., have left for naval and military service.

Clocks not "Made in Germany."—Messrs. Gent & Co., Ltd., of Leicester, write to point out that "Pulsynetic" impulse clocks are a "home-made" production, being manufactured at their own well-appointed works.

It may be also mentioned that "Invar," or non-expanding, nickel steel for pendulums was almost exclusively a German production until Gent & Co., Ltd., some years ago introduced British-made "Sinevar" non-expanding nickel steel. "Sinevar" steel has a coefficient of expansion of only ·0000010 per cent. per degree C., and all Pulsynetic time transmitters are fitted with pendulums of this useful alloy.

G.E.C. Men with the Colours.—At the beginning of the week close on 10 per cent. of the total number of employés of the General Electric Co., Ltd., had joined the colours. The actual numbers for the various offices and works are as follows:—Head office (67, Queen Victoria Street, London, E.C.), 75; provincial branches, 70; Union Street Works, 8; Salford Electrical Instrument Works, 8; Peel-Conner Telephone Works, 24; Witton Works (including the engineering works, carbon works, conduit works, and the Ileene works), 165. Mr. H. Clifford Palmer (manager, publication department) is a lieutenant in the London Scottish, and Mr. W. E. Curtis (manager, bought ledger department), is also an officer, his regiment being the Army Service Corps (Territorials).

A British Firm.—Messrs. H. Hartjan & Co., of 35 and 37, Noble Street, London, E.C., write that the sole partner in the firm is a born Englishman, and with the exception of a non-German foreign correspondent, the staff are all British. The name alone is of foreign extraction (Norwegian).

Egypt and South America.—The Board of Trade has received the following information from H.M. Consul at Alexandria:—

"If the cotton crop is successfully financed, the conditions and prospects of trade will be favourable. The United Kingdom should secure a large proportion of the German Empire's very valuable trade with Egypt, in all manufactures of good quality, such as machinery—especially artesian-well apparatus—canvas hose, machine tools, gauges, wrought-iron pipes and tubes, files, bolts, &c., and in textiles imitating popular patterns. Successful competition is improbable in inferior, 'cheap and nasty' goods such as crockery, pewter, ironmongery, hosiery and haberdashery. Our serious difficulty is that long credit (six or twelve months) is indispensable, as fellaheen pay only by instalments."

H.M. Consul-General in Rio de Janeiro reports:—

"According to telegrams from New York, United States of America firms are preparing to send a veritable army of commercial travellers to South America, especially to Brazil, Argentina and Chile, with a view to the capture of German trade in those markets."

Glassware.—Messrs. Holophane, Ltd., referring to the stoppage to the importation of Continental-made glassware, inform us that Holophane is the only form of prismatic glass which is made in this country. Their works at Gateshead are well equipped for dealing with any demands which may be made upon them, and it is not anticipated that any difficulty will arise in regard to supplies of raw material. For these reasons, the prices of Holophane glassware will remain as before, although the shortage of ordinary reflectors has led to a very substantial increase in prices.

Limited Companies and Alien Shareholders.—The Board of Trade has issued a notice warning all joint stock companies and their officers that:—

1. No dividends or interest declared or becoming due after the outbreak of war should be paid during the war to or in accordance with instructions from any person resident in enemy territory. Such dividends or interest should be paid into a separate account at a bank to be disposed of after the conclusion of the war.

2. No transfer of any shares or debentures from any person resident in enemy territory should be registered during the war.

Supply Meters.—The Bastian Meter Co., Ltd., wish it to be known that they hold large stocks of raw materials and will have no trouble in expeditiously meeting all orders. The Bastian meter is manufactured throughout in England with British labour and British capital.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Panama, Berlin and Fraternity.

It is not usually the policy of your journal to interfere in matters of politics, more especially when such matters assume an international aspect, but at the present time, when all conventions of peaceable life are being ruthlessly upset, I should like to refer to an aspect of the present struggle which concerns in a very direct manner the electrical engineering industry not only of this nation, but also of one to which we are bound by ties of blood and memory. In the past we have received from the American technical journals such evidence of their genuine interest in our commercial and technical well-being that we feel sure that at the present time, when the resources of the British nation, both military and commercial, are being subjected to a test such as has never before been experienced, we shall find a hearing not only among Britishers who have influence in the world's markets, but also in the United States of America, where our cousins have stood for the most advanced principles of commercial and technical progress.

The United States and ourselves are in a commercial sense neighbours. No cause or state of war exists between us. Commerce to us and to them is equally a vital thing, and the world's markets are wide. Pressure of competition from Germany, a competition which has been rendered possible very largely by the use of low-priced labour, has been temporarily removed, opening a valuable prospect to those who can take up the trade. As for ourselves, we are still in business, but it must not be denied that while our attention and our resources are largely occupied in safeguarding our national interests and even existence, we cannot devote quite the same attention to business expansion as we could otherwise do. Supposing that a man were busily employed in kicking an intruder out of his front garden, it would not be a neighbourly act of the man next door to steal his poultry from the backyard, and while we may feel that the electrical engineering fraternity of America would not consciously do anything so mean, they might be asked not only as a matter of courtesy, but as a measure of common interest, to refrain from doing anything which would undercut or curtail the present volume of British export business.

I say this not because I think that citizens of the United States would desire to weaken us at the moment of our greatest need, but because there is always the temptation of an open market and weakened competition. Under normal circumstances competition is a fair test of merit; under abnormal circumstances it is not merely courtesy, but preservation of safety to blunt the keen edge of competition when this is directed against friends. I appeal on the ground, first, of that spirit of fairness which has only recently demonstrated its power in a magnificent way in the

United States over the force of money grubbing. For some time the Panama Canal presented the possibility of acute misunderstanding between us. The magnificent determination of President Wilson saved the world from witnessing the imposition of what in many quarters would have been considered an undue balance in the administration of the canal charges. We can therefore with confidence appeal to a nation which has already manifested in a commercial matter its sense of international fairness.

This appeal may also be made on the ground of common safety. Great Britain is not at present waging war either in a military or commercial sense due to a lust for territory. It is taking part in a struggle in which free commercial peoples are ranged against nations whose undoubted genius for commerce and technical progress is overshadowed and strangled by an all-absorbing militarism, whose power is vested in the hands of a very few persons not directly concerned in the progress of the nations as a whole. As Mr. H. G. Wells has pointed out in the tremendous appeal which he has made to America, "Let us not attempt to deny the greatness of Germany and of Germany's contributions to science and art and literature and all that is good in human life. But evil influences may overshadow the finest peoples, and it is our case that since the victories of 1871 Germany has been obsessed by the worship of material power and glory, and scornful of righteousness; that she has been threatening and overbearing to all the world. There has been a propaganda of cynicism and national roughness, a declared contempt for treaties and pledges, so that all Europe has been uneasy and in fear." The result of the present struggle will be felt almost as acutely by the United States as by Great Britain, because it is a struggle of enlightenment against the autocracy which although obsolescent, has yet sufficient remaining force to shake the fabric of present day existence. On the ground of fraternity of interest, therefore, we claim from American engineers not merely the policy of "hands off" as regards British markets for electrical engineering goods, but all the assistance which they can in fairness to themselves give to our struggle against the policy of militarism which, fostered by German philosophy and cast into a mould of blood and iron by the descendants of Bismarck and Von Moltke, has found its focus in the councils of Berlin. Obviously if the sole or main use of the electric arc were its employment in the military searchlight or if high-tension electricity were chiefly used in energising wire entanglements for the slaughter of human beings, the output of the world would be enormously restricted as compared with its possible expansion under conditions of assured peace free from the menace of militarism, and it is precisely this position that I am attempting to determine.

As one practical example of the way in which our American cousins can help us, there is the question of Canada. From Great Britain and also from America there has flowed in recent years a steady stream of progressive men and women, who have peopled the north lands and rendered them to a large extent productive and fertile. New industries are springing up, and a tremendous opportunity has been given to business expansion. Now that the call of need has come, Canada has sent back a return tide of thousands of her best born to help in the military defences of the British nation. To a corresponding degree Canada is weakened commercially. America has up to now shown the utmost brotherhood to the new nation across the border. No vessels of war ply on the Great Lakes. Commerce has been keen, but above board. We rely upon the American nation to stand by Canada in this hour when Canada is standing by us. One of the American technical journals says: "England became great largely through its isolation in a former European war. There is no reason why America should not emerge from the present world disaster with the advantage entirely on her side." While we may wish America every possible technical and commercial success, is it too much to ask her to follow the memory of her fairness with regard to Panama by an equally striking demonstration of her determination not to reap "advantage" at the expense of that nation which is fighting a battle of progress which is so essential to America?

Innocens.

Wireman or Electrical Fitter?

I think your correspondent "El-Les" of last week has called attention to a matter that stands urgently in need of revision.

As things stand at present, anyone can style himself a wireman or electrician as the case may be, in fact, a case came to my notice last week of a man who was a 'bus conductor 18 months ago, but is an "electrician" now at 10½d. per hour. There seems to be no compensation at all for the man who sacrifices his spare time to attend the various Polytechnics, to attain the technical knowledge that is so essential.

How many, I wonder, of the so-called wiremen could pass last year's City and Guilds Final Wireman's paper?

Hopeful.

British (?) Firms: A Suggestion.

At the present time it appears to me of vital importance that consulting engineers, architects and electrical contractors should have some ready and easy means of acquiring information as regards manufacturing and factoring firms in this country. I am sure you will readily agree that these gentlemen should wherever it is possible deal exclusively with firms whose financial interests are entirely British, who employ British labour, and, in the case of manufacturers, who use British material.

I feel sure that you would be doing the greatest possible service to the electrical trade if you compiled such a list and notified it boldly in the Review for several weeks that readers desirous of such information could apply for same. I would suggest that firms should be classified under various headings; something of this description:—

British throughout.

German or Austrian throughout.

Financial interests partly held by Germans or Austrians, stating if possible proportions.

Financial interests entirely owned by naturalised Germans or Austrians.

Financial interests partly owned by naturalised Germans or Austrians.

To each report could be added particulars as to whether any foreign labour is employed.

There are many firms at the present time registered under an English title whose interests are almost exclusively German.

Trusting that the above will receive your serious consideration—

Sydney S. Galsworthy.

London, *August 29th*, 1914.

What Constitutes a British Firm?

I notice on page 312 of the current issue there is a letter from a member of a well-known firm of consulting engineers with regard to the constitution of the Stafford firm of Siemens. It is quite possible that the present generation of engineers are not entirely conversant with the work done by the various members of the Siemens family in this country, but at the same time one must bear in mind that these gifts have been made with one object in view, and that is the advancement of Siemens business in this country. Whilst one would not style it as "corrupt practice," there is no doubt that these gifts have had the effect of large orders being placed with the Stafford firm, the general idea being that the orders themselves were to be executed and manufactured at Stafford, but, as a matter of fact, the greater proportion comes from the Continent, and if we are to be patriotic at all, such firms should be entirely barred, because by placing orders with them we are supporting an alien enemy. I would suggest that the Government place this firm in the hands of a public trustee, and all dividends which may accrue should be utilised in repaying this country for the fearful expense it is being put to by the German nation.

Our present war is not against individuals, but against the whole combine of the German States, and we cannot deal with individual cases on their merits.

The Walsall Electrical Co., Ltd.,
J. Delebecque, *Works Manager.*

Walsall, *August 31st*, 1914.

In your last issue appeared some remarks from a firm of consulting engineers with reference to German-backed companies in England, and the fact that they had been asked apparently by some rival firm to transfer their orders to the entirely British concerns. It is hard to believe that any rival representative would wish to see the English employés out of jobs, but the idea of losing orders, knowing that 90 per cent. (to take the consulting engineer's figures) of the profit on such orders goes to our enemies, is rather sickening. A suggestion appeared in the daily Press which seems to meet the case, namely, that the foreign holding in such firms should be attached, and placed in the hands of the Public Trustee. Any profit earned during the war period or before the final settlement would then not go to help our enemies to foot the bill they are running up.

Fairplay.

August 31st, 1914.

I notice a paragraph in your paper, "What Constitutes a British Firm"? and you quote some consulting engineer (who also is probably a German, because he is ashamed to sign his name) supporting Siemens. The very fact that 90 per cent. of the capital of this company is held in Germany is sufficient to an Englishman, one would think, to condemn them, but when you think that in the past this German firm, with 90 per cent. of its capital in Germany, has been able to quote to the Secret and Confidential specifications of our War Office and Admiralty, one hardly wonders that representatives should ask that this firm should be barred.

A very large number of their employés were German, and, no doubt, held positions in this country that, if they could have remained, would have been most useful to the German army at a later date.

Sir (*sic*) Alexander Siemens has got one thing to his credit, and that is that he has never been ashamed of his name, and has kept it Siemens. The time surely has come when loyal consulting engineers should support at least concerns which are financed with English money, and not 90 per cent. German money. Obviously the work that Sir (*sic*) Alexander Siemens has done, has been done for the advertisement of Siemens Dynamo Works and Siemens Bros. There was no reason why a German should give a laboratory to King's College, or do any other similar work, unless he had fish to fry for his country.

I suggest that in the interests of Englishmen you publish the name of the consulting engineer who sent you the article, and if this is done I shall have pleasure in your also publishing my name. Otherwise I ask you to publish this without my name, and enclose my card.

X.

August 28th, 1914.

It would be of great assistance to a large number of buyers who desire to purchase only English material if you would give some guidance in the purchase of metallic-filament lamps.

Owing to the complicated ramifications of the foreign manufacturers with their inter-working agreements, &c., it is indeed difficult to know which is really all English, including the glass ware, and which is only partly so. You need not, I think, specify those firms who are only partially English, as this may appear somewhat vindictive; it would, I think, meet the case equally as well if you merely set out the names of the few firms known to you as manufacturing and selling metallic-filament lamps made in England, and whose share capital is English, and where all the material is actually manufactured in England.

If you could do this I am sure it would be a great boon to those who have the purchasing of material and the influencing of customers' requirements, and who desire, as far as possible, to keep the trade in our own country.

H. F. Friederichs.

West Hartlepool, *September 1st*, 1914.

[Other letters, received too late for inclusion here, will be found in our "Notes" columns.—Eds. Elec. Rev.]

BUSINESS NOTES.

Trade Announcements.—Mr. H. H. Williams, late of Messrs. H. R. Williams & Co., electricians, of Barnstaple, has opened business at Falmouth.

Messrs. A. E. Hornsby & Co., electrical engineers, of 130, High Street, Gillingham (Kent), have removed their business to the Invicta Works, High Street, Old Brompton.

Mr. E. Arthur Pinto, of Ramsgate, Dover and Hythe, is opening new showrooms at 119, Northdown Road, Cliftonville, Margate. He will be glad to receive catalogues, lists, &c., at that address.

Messrs. Simplex Conduits, Ltd., have removed their Liverpool branch from 1, Dawson Street, to more extensive premises at 96, Whitechapel, Liverpool, where greatly increased stocks are now held. The new premises contain, in addition to large and convenient counter trade accommodation, a well-appointed private showroom to which all contractors and architects are invited to bring their clients.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., announce that owing to the rapid increase of business at their branch for the Midland district at 167, Edmund Street, Birmingham, they have found it necessary to take additional and adjoining premises at 165, Edmund Street. They will now hold much bigger stocks for the convenience of their customers. Their address is now 165 and 167, Edmund Street, Birmingham.

Panama Exhibition.—The British Committee has dissolved owing to the war. The Exhibition will open on February 20th next and close in December.

Bankruptcy Proceedings.—The Bristol International Exhibition, Ltd., Exhibition Offices, Ashton Avenue, Ashton Gate, Bristol.—In this matter the winding-up order was made on the petition of creditors, and, according to the statement of affairs prepared, the liabilities amount to £28,866, while, after deducting the claims of the preferential creditors, the assets were insufficient to meet the claims of the debenture-holders. As regards the contributories, there is a deficiency of £33,750 odd. It appears that the company was registered in May, 1912, as a private company, with a nominal capital of £2 000, divided into 2,000 shares of £1 each. The objects of the company were to carry on an exhibition of machinery, arts, industries, &c., in or near the City of Bristol. The capital was increased to £5,000 under an agreement dated May 5th, 1913, by the addition of £3,000, which was divided into 3,000 shares of £1 each. Charles Howes, of Knowle, Bristol, commission agent, was the promoter of the company, and a meeting was called on November 24th, 1911, at his instance, when it was decided that a limited company should be formed to carry on an exhibition of arts and industries in the year 1914, the exhibition to include a pageant of Bristol. It was considered, about February, 1912, that the exhibition and the pageant could not be run conjointly, and it was decided that a company should be formed to carry on the exhibition of arts and industries, and enter into a contract with a limited company which was to be formed. Memorandum and articles of association were framed for the last-named company, but they were never registered. The Bristol International Exhibition, Ltd., instituted a guarantee fund in Bristol and the West of England to obtain the necessary working capital, and a further guarantee fund, with the object of raising £120,000 in all. The Bristol guarantee fund amounted to £259 odd, while guarantees for £80,000 were obtained under the other guarantee fund between June, 1913, and January, 1914. In consideration of the company giving them a charge on the guarantee funds and the revenue policy, Lloyd's Underwriters issued six policies, amounting to £70,000, to five creditors of the company, for moneys advanced and work done on behalf of the company. A policy was also effected by the company with Lloyd's Underwriters under which the latter undertook to pay the difference between £95,000 and any less sum which might be received from all sources in respect of moneys due to the company. The policy is subject to certain warranties, which, however, had not been fully complied with. Fourteen creditors had obtained judgment against the company at the date of the winding-up order, and the company had for some months experienced some difficulty in meeting its debts as they fell due. The failure of the company is due to inability to obtain the support of prominent Bristol citizens, insufficient capital, heavy commissions and premiums in respect of the guarantee fund and Lloyd's policies, extra cost of construction, chiefly labour, through endeavouring to complete the buildings for the opening of the Exhibition on May 28th, 1914, and the inclement weather experienced after the opening, which seriously affected the takings.

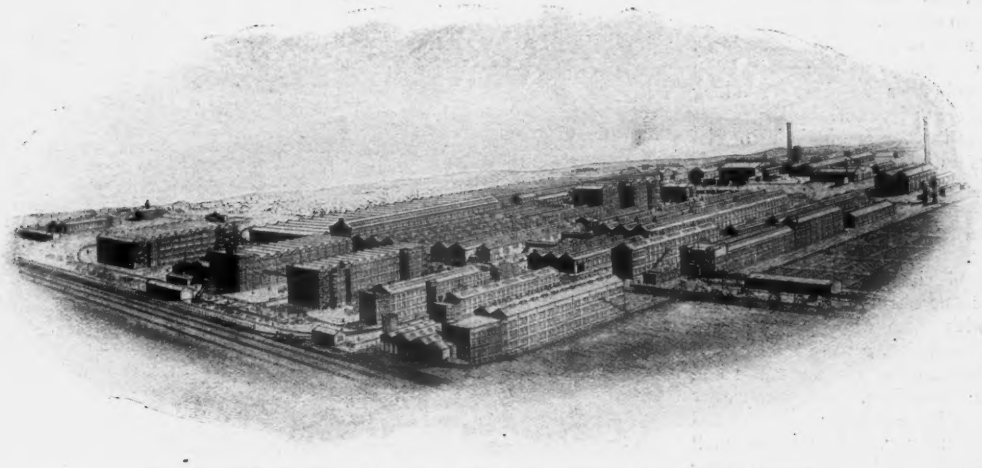
The following are among the creditors:—Avery, W. & T., Ltd., £120; Colston Electrical Works, Ltd., Bristol, £213; Electrical Engineering and Equipment Co., London, £830.

Archibald Atkinson, cycle and electrical engineer 30, Great George Street, Leeds.—Receiving order August 27th. Debtor's own petition. First meeting September 9th, at Official Receiver's office, 24, Bond Street, Leeds. Public examination, September 29th, County Court House, Albion Place, Leeds.

(*Continued on page* 339.)

THE BRITISH THOMSON-HOUSTON CO.'S WORKS.

This great manufacturing organisation has its head offices and works at Rugby, but is also represented directly or indirectly in all parts of the world. The apparatus produced by the company cover a very wide range of electrical manufacture, and include tramway and railway equipments, Curtis steam turbines, A.C. and D.C. generators and motors, rotary converters, transformers, the Mazda drawn-wire and the Mazda half-watt incandescent lamps, electrical measuring instruments, high and low-tension switchgear, and electrical heating and cooking devices.



Bird's-eye View of the British Thomson-Houston Co.'s Works, Rugby.

Rugby works occupy a site some 39½ acres in extent, of which about 24 acres are covered by roads and buildings; these works have a total floor space of 800,000 sq. ft., the floor area of the company's three factories at Rugby, Willesden and Coventry aggregating well over a million sq. ft. The majority of the buildings at Rugby are of steel and brick construction, but the two latest buildings are of reinforced concrete; the arrangement provides for minimising as far as possible internal handling.

The works are connected with the London and North-Western and the Midland Railways, and the handling of material in the works yard is taken care of by a locomotive and two travelling cranes running on standard-gauge tracks which connect all the principal buildings, while all light

Turbine Shop in the B.T.H. Co.'s Works.

The erection of the Rugby works was commenced in 1900, and when the factory was opened in the following year it provided work for some 500 operatives, the total floor space covered being 200,000 sq. ft. The present

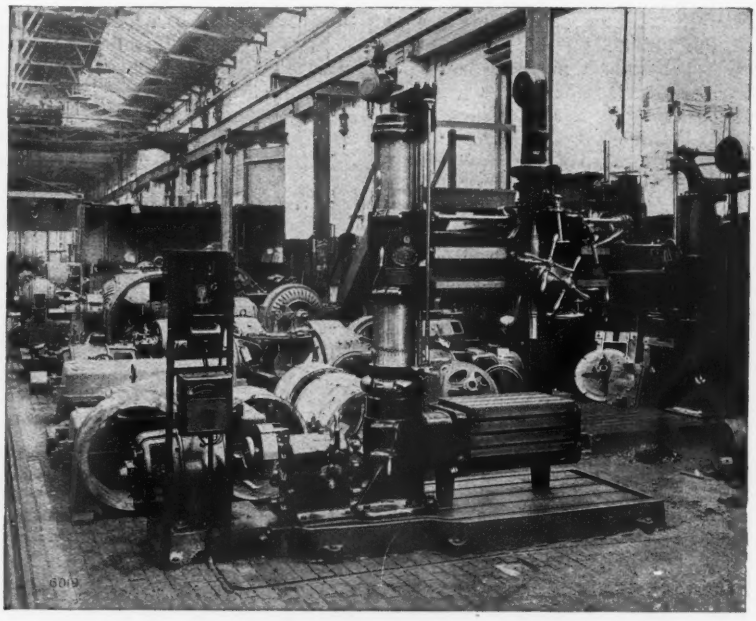
shunting is provided for by electric capstans placed at convenient points. As the floor level of the large ferro-concrete building is some 17 ft. below that of the remainder of the works, a 40-ton electric lift is provided to transfer loaded trucks to and from this building. Material inside the buildings is handled by over 30 electric travelling cranes, the largest of which has a capacity of 40 tons and a span of 66 ft., and a large number of fixed cranes, in addition to which a comprehensive narrow-gauge railway system connects all parts of the works.

The fire-extinguishing equipment of the works has been carefully thought out so as to eliminate, as far as possible, all chance of a fire gaining headway, and the company has organised an efficient volunteer fire brigade among the members of its staff.

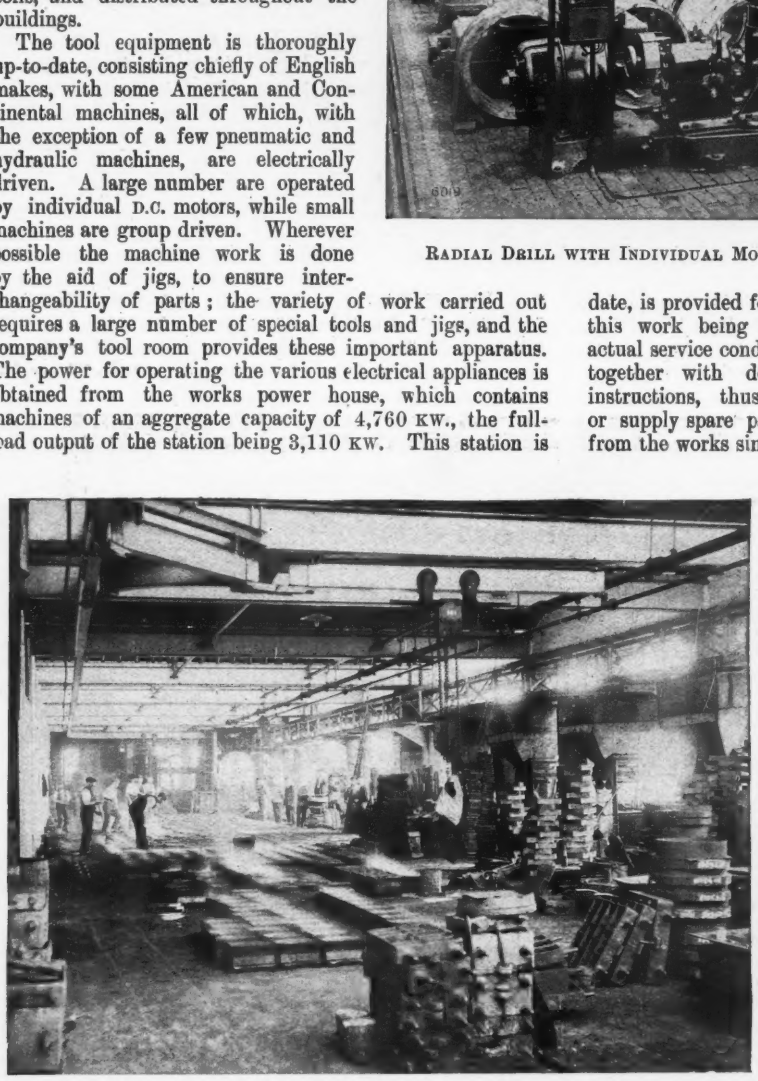
The heating for the majority of the buildings is planned on the hot air blower system, air being drawn in from outside, passed over steam-heated coils, and distributed throughout the buildings.

The tool equipment is thoroughly up-to-date, consisting chiefly of English makes, with some American and Continental machines, all of which, with the exception of a few pneumatic and hydraulic machines, are electrically driven. A large number are operated by individual D.C. motors, while small machines are group driven. Wherever possible the machine work is done by the aid of jigs, to ensure interchangeability of parts; the variety of work carried out requires a large number of special tools and jigs, and the company's tool room provides these important apparatus. The power for operating the various electrical appliances is obtained from the works power house, which contains machines of an aggregate capacity of 4,760 KW., the full-load output of the station being 3,110 KW. This station is interesting as showing the tremendous development which has taken place in the design of electrical machinery during the past 10 years, the machines installed ranging from low-speed reciprocating engine-driven sets to the latest high-speed turbine-driven generators of the company's own manufacture.

The thorough testing and inspection of all apparatus in the finished state and in the various stages of manufacture are features to which great care and attention are given; thorough examination after each operation reduces to a minimum the possibility of defective or inaccurate work reaching the assembly department. A very elaborate and complete equipment, which is kept thoroughly up-to-date, is provided for the testing of all finished apparatus, this work being carried out as nearly as possible under actual service conditions, and complete records are preserved, together with details of the original manufacturing instructions, thus enabling the company to duplicate or supply spare parts for any piece of apparatus shipped from the works since their inception.



RADIAL DRILL WITH INDIVIDUAL MOTOR-DRIVE, IN MAIN MACHINE SHOP.



TOP FLOOR OF FOUNDRY; MOULDING MACHINES FOR RESISTANCE GRIDS ON THE RIGHT.

In view of the necessity for rapid extension of its manufacturing facilities the company has acquired premises at Willesden and Coventry, to which the switchgear and electrical instrument factories respectively have been removed. In addition to electrical instruments, the Coventry works also take care of the manufacture of electrical heating and cooking devices, &c.

Although many distinguishing features are embodied in the design of B.T.H. apparatus, it is only possible to describe here a few of the most important of the company's manufactures, of which the following are typical.

The company specialises in turbines of the impulse type, as exemplified by the Curtis turbine, which has been manufactured at Rugby since 1904. Such turbines are made for capacities of about 40 H.P. and upwards, and are of two main types, high-pressure and mixed-pressure, the latter being designed to utilise the exhaust steam from reciprocating engines.

B.T.H. motors, both A.C. and D.C., are designed as standard machines, of which a certain number are always kept in stock, thus enabling demands for these machines to be readily met; they are designed for all ordinary voltages and in the sizes most in demand. The company's wide experience in this field, however, enables it to design and construct machines suitable for any special set of conditions with the minimum of delay.

The B.T.H. rotary converters are built for capacities up to 3,000 KW. for any standard voltage up to 1,500 volts D.C.

on 25 cycles, and 750 volts D.C. on 50 cycles, and are suitable for reactance, booster, or induction-regulator control. The company has also patented a two-part split-pole method of controlling the voltage ratio on its 25-cycle machines, which is free from the defects inherent in the three-part pole system, and has met with great success wherever installed.

A large number of different types of controllers are manufactured for traction, haulage, machine tools, printing presses, &c., each type being carefully designed to enable the machine with which it is used to be handled with absolute safety. The company also manufactures many automatic starting and regulating equipments for use with motors operating under the most arduous conditions.

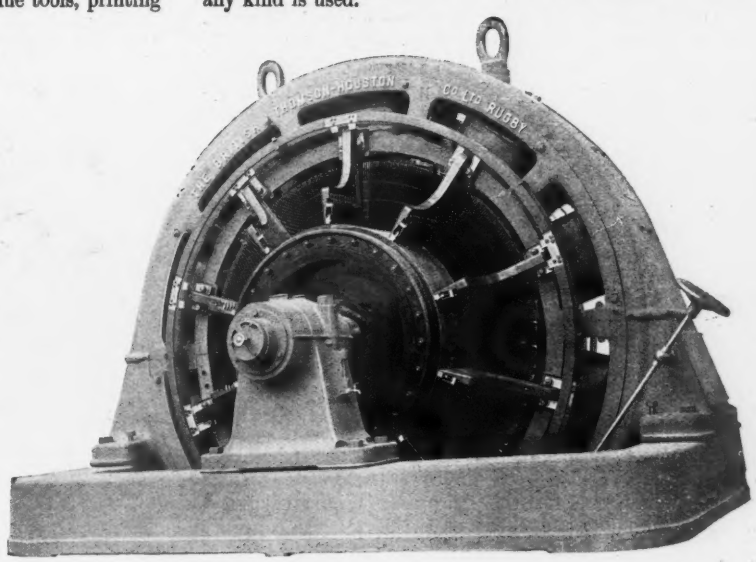
One of the best known products of the B.T.H. Co. is the Mazda drawn-wire tungsten lamp, which was introduced by the company in 1911, and is now supplemented by the half-watt lamp, in sizes above 600 C.P.

The company's employés number nearly 6,000, of whom 4,013 are employed in the Rugby works and offices.

The Coventry factory occupies a site of some 42,000 sq. ft., and consists of four buildings, one of which is devoted entirely to the various offices, which provide employment for a staff of approximately 170; the three manufacturing buildings, which are arranged for the accommodation of 1,500 employés, are single bay structures of steel and brick. The machine tool equipment, which is thoroughly up to date, has been carefully arranged for group driving by electric motors. As most of the work handled is of a light nature, an elaborate transport equipment is unnecessary. A thorough examination of all parts of apparatus is made by the inspection department at various stages of manufacture, and the finished apparatus are subjected to rigorous tests in a testing department provided with a thoroughly modern and complete equipment.

The apparatus manufactured at this factory is all of a light nature, and includes electric supply meters, measuring instruments, reverse current and overload relays, high and low-voltage cut-outs, Tirrill voltage regulators, electric heating and cooking devices, contactor gear for traction work, arc lamps, speedometers, &c. A few of the most important of these are briefly described in the following notes:—One of the best-known products of this factory is the Thomson watt-hour meter, suitable for voltages up to 650 volts, and currents up to 3,000 amperes on three-wire, or 10,000 amperes on two-wire circuits.

An ampere-hour meter of the mercury type is also manufactured in large quantities; this is distinct from other forms of mercury meter in that no compounding device of any kind is used.

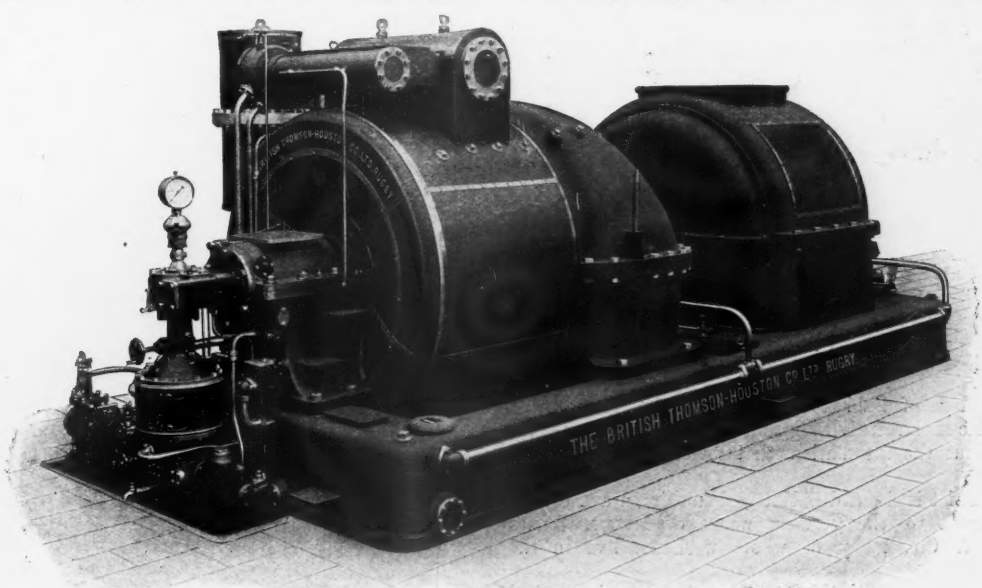


B.T.H. Compound-wound, Interpole Rotary Converter, 1,500 kw., 25 cycles, 300 r.p.m., 600 volts, for L. & S.W. Ry.

B.T.H. single-phase A.C. meters are of the induction type, and are characterised by high torque, small losses, and very good accuracy characteristics.

Meters for two and three-phase circuits, in which two single-phase elements are employed, are also manufactured; the two disks are mounted on the same spindle, one of them being damped by means of permanent magnets in the usual manner. These meters are connected in accordance with the well-known two-wattmeter method of measuring power on polyphase circuits. They are made for both switchboard and house service. Single-phase meters fitted with a prepayment mechanism are also manufactured in large quantities for house service.

The Tirrill regulator, which provides a satisfactory and reliable method for automatically and instantaneously regu-



B.T.H. Curtis Turbo-Alternator, 5,000 kw., 1,500 r.p.m., 2,200 volts, 50 cycles, for the County of London Electric Supply Co., Ltd.

lating voltage, is also manufactured in these works, and is capable of limiting voltage variation within one half of 1 per cent. above or below normal under all conditions of load or power factor, provided the exciter voltage range for which the regulators are designed is not exceeded.

A large variety of electric heating and cooking appliances is manufactured, including radiators, water heaters, kettles, flat-irons, grills, glue-pots, stoves, &c. The distinguishing feature of these devices is the heating element, which is composed of Calorite, a metal possessing a very high resistance and a melting point in the neighbourhood of 3,000° F., while it will withstand oxidation to a very high temperature, being, in fact, for all practical purposes thermally indestructible.

BALDERTON ELECTRIC LIGHTING.

The subject of village lighting is one of increasing importance, and one to which greater attention is being given every day. Throughout this country there are many small communities which possess no light, or a very inadequate supply, provided either by gas or oil. In these small towns and villages there is a growing demand for better and cheaper lighting, and engineers are doing their best to grapple with the solution of this problem. That the field is large is unquestionable, and we may point to what has been done in the North of Yorkshire towards developing small water-power plants for this purpose. Where energy is available in bulk at a cheap price the question is greatly simplified, and the installation of electricity becomes a

Balderton Street-Lighting.

paying proposition, which appeals to the ordinary councillor.

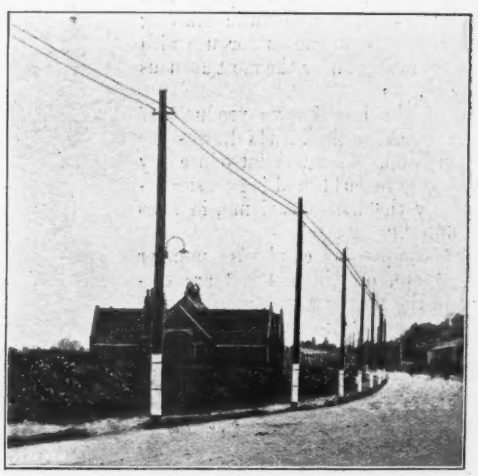
The village of Balderton is one of the latest to go in for an electric street-lighting scheme, and there are several points about the installation that give it more than usual interest.

The district is situated in Nottinghamshire, near Newark, and adjacent to the growing works of Messrs. James Simpson & Co., many of whose workmen live in the village.

By arrangement with this company, electricity is supplied by it to the Council for all lighting at 1d. per unit. The system of distribution adopted was overhead wires erected on wood poles. In order to cheapen the cost of the installation, bare stranded aluminium wire was used throughout, and by this means a considerable saving, not only in first cost of material, but also in the labour of erection, was effected. It may be pointed out that for this class of work aluminium is growing in favour, and it is now being largely used, after severe trials, by the War Office; but, as far as we know, this is the first installation put up under a Local Government loan, in which the use of wooden poles and bare aluminium wire was sanctioned. The period of repayment of the loan was fixed at 15 years.

The district which is lighted includes about a mile of the Great North Road, and finishes at the Newark boundary. The lamps erected number 24 100-watt and 49 60-watt street-lighting Mazda lamps, the voltage being 220. The 100-watt lamps are used to illuminate the Great North Road, and the 60-watt lamps for the village and side streets.

The main cables carrying the current from the works are 7/·148 stranded aluminium, and about 3,000 yd. of this

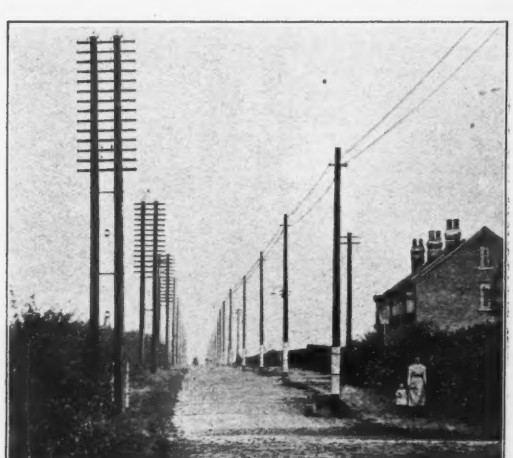


Side-street Lighting.

were erected. In the main streets 7/·103 strand is used, and in the side streets 3/16 S.W.G. strand. In all, about 12,000 yd. of cable have been erected.

The poles vary in size from 36 ft. long and 13 in. in diameter to 32 ft. long and 8½ in. in diameter, and are spaced about 100 ft. apart, every alternate pole being a lamp pole.

The lamps are carried on simple brackets clamped round the poles, combined with a fuse-box containing double-pole fuses to protect each lamp. The wiring to the brackets is aluminium rubber-insulated wire cleated to the poles, the chief object being to use nothing but aluminium wire, so



Lighting the Great North Road.

as to simplify jointing. The joints are of the usual torsion type, with special twist joints for the tappings. At suitable points the circuits are controlled by sectional switch boxes clamped on the poles.

Choking coils and lightning arresters are fixed near Messrs. Simpsons' works. Where the mains cross the road,

and the trunk telephone lines, armoured bitumen cable laid direct in the ground is used; all other crossings are overhead.

The cost of energy for the whole installation is about 6d. per hour, and it is calculated that by economy in lighting hours the cost can be kept down to about £45 per annum, where the same illumination by gas would cost roughly £80. The installation has now been working for some months, and has given every satisfaction.

The consulting engineer was Mr. F. C. Geis, of New Balderton, and the installation was erected by Messrs. Loxley & Co., Ltd., of Leeds.

BUSINESS NOTES.

(*Continued from page 334.*)

Liquidations.—THE EUREKA CLOCK CO., LTD.—Particulars of claims must be sent in by September 23rd, to the liquidator, Mr. A. E. Tilley, 8, Staple Inn, E.C.

THE MORDEY-FRICKER ELECTRICITY METER CO., LTD. — At extraordinary general meetings of the company, held on August 12th and 27th, it was resolved and confirmed: "That the assets and business of the company be sold to the British Insulated and Helsby Cables Co., Ltd., for £8 500, and that the company be wound up voluntarily, with Mr. F. Miller, of 82, Victoria Street, S.W., as liquidator."

Book Notices.—*Commercial Year-Book of the Birmingham Chamber of Commerce.*—This is the fifth edition of a useful Year-Book relating to the industrial resources and manufactures of the City of Birmingham. It is circulated extensively in the Colonial and foreign markets, and its issue at the present time fits in well with the campaign to secure trade that has hitherto gone to Germany.

"Science Abstracts," Sections A and B. Vol. XVII, Part 8. August 25th. London: E. & F. N. Spon, Ltd. Price 1s. 6d. net each.

Private Arrangements.—ACCUMULATOR INDUSTRIES, LTD., Oriental Institute, Woking.—In accordance with the resolutions passed at the recent meeting of creditors of the above, an application has been made to the Court, and Mr. G. E. Corfield, of Messrs. Corfield & Cripwell, accountants, of Balfour House, Finsbury Pavement, E.C., has been appointed to act as joint liquidator in the voluntary liquidation of the company. According to the approximate statement of affairs which has been prepared, the liabilities amount to £46,229, while the issued capital is £37,318. At book values the assets are valued at £8,592, but at a forced realisation they are only expected to produce £3,627. From the latter figure has to be deducted £187 for preferential claims, leaving net assets of £3,440, or a deficiency as regards the creditors of £42,789. The following are creditors:—

American Hard Rubber Co.	£40	Matthews Bros.	£18
Baird & Tatlock	16	Morgan, R. L.	100
Brewster & Co.	58	McLaren, W.	38,883
Buck & Hickman	30	Morris, H. M., & Co., Ltd.	31
British Oxygen Co.	92	National Gas Engine Co.	19
Campbell, Hooper & Todd	785	Pilchars, Ltd.	36
Crow, W. R., & Son	25	Pirelli, Ltd.	72
Denny, Mott & Dickson	111	Ractsch, Ltd.	89
Francis Barnet Mfg. Co.	154	Redfern & Co.	1,011
Garland, A. E.	27	Skeet, Fooks & Jefferies	93
Holzapfel & Hilghs	56	Smith & Sons	47
Ingram, J. E., & Son	16	Sully, J. & A. W., & Co.	178
Kingsford, Dr.	93	Twyford, R. J.	1,271
"Bankers"	945	Tudor Accumulator Co., Ltd.	100
Lees, W., & Co.	20	Vacuum Oil Co.	15
London Electric Wire Co.	41	Wilcox & Co.	15
Macdonald, J.	24		

THE NATIONAL ELECTRIC TIME CO., LTD., 15, Great Sutton Street, London, E.C.—Pursuant to the provisions of the Companies' (Consolidation) Act, a meeting of the creditors interested herein was held a few days ago, when a statement of affairs was presented showing liabilities of £632. The assets were estimated to realise £162, less £89 for preferential claims, leaving net assets of £72, or a deficiency as regarded the unsecured creditors of £559. It was reported that the company was registered on November 21st, 1912, with a nominal capital of £5,000 in £1 shares. The company took over an existing business, for which it paid £1,250. Of the purchase price £250 was paid in cash, and the balance by the issue of fully paid shares. Some 750 shares had been issued for cash. An approximate trading account was presented which showed that up to December 31st last the company had traded at a loss of £600. It was stated that negotiations were in progress for the sale of the business as a going concern, and the opinion was expressed that the negotiations should be carried through. After a short discussion it was decided to confirm the voluntary liquidation of the company with the liquidator appointed by the shareholders.

Catalogues and Lists.—MESSRS. VENNER'S SIGNS, LTD., 6, Old Queen Street, London, S.W.—New catalogue of 32 pages, containing illustrations of a number of examples of electric sign work carried out on their Venner patent system. It should be interesting and useful to all concerned with electric sign installation and progress.

MESSRS. P. A. LUNDBERG & SONS, Pioneer Electrical Works, Islington, N.—New list, No. 837, of bell-pushes, push-keys and kindred accessories, giving prices and particulars of a variety of improved devices of the press-button type and plug connections.

THE PREMIER ACCUMULATOR CO., LTD., Northampton.—12-page illustrated price list of their portable batteries for lighting and ignition purposes for motor-cars; various sizes and sets for starting batteries, lamps, &c., are shown. The firm are supplying a large number of these batteries.

MESSRS. ED. BENNIS & CO., LTD., Little Hulton, Bolton.—A handsome brochure on "Recent Developments in Machine Stoking," showing how smokeless combustion of coal can be attained by the use of an efficient chain grate together with economy of fuel and the ability to use cheap grades of coal. The essential feature of the Bennis chain grate—the Bennis-Miller-Bennett halved links, which prevent the admission of excess of air—is described, as well as other improvements in detail, and some remarkable instances of increased output and lower fuel cost are quoted. Many illustrations are given, and details of tests. Copies can be had on application to the company.

ELECTRICAL APPARATUS CO., LTD, Vauxhall Works, South Lambeth Road, S.W.—Leaflet H 48 describing new high-pressure oil-immersed ironclad switchgear for collieries, sub-stations, &c.

THE BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—Price list No. 7,201 A, dealing with B.T.H. small-power motors for A.C. and D.C., in sizes from $\frac{1}{10}$ to $\frac{1}{2}$ H.P., and for voltages of 110 and 220.

LIGHTING and POWER NOTES.

Argentina.—The Municipality of Lincoln has applied to the Government of the Province of Buenos Ayres for leave to sell its electricity and water-works. These works cost $400,000, which is still owed. The Mayor forwarded at the same time two forms of contract with Mr. Mauro Herlitzka for the working of the stations for 20 years.

A local company has been formed in Viedma (Rio Negro), with a capital of $120,000, for the erection of an electricity works.—*Review of the River Plate.*

Australia.—The Premier has set aside £100 for preliminary inquiries into the schemes for the generation of electricity for the proposed irrigation works in connection with the Yarragamba, Nepean and Hawkesbury rivers.

Barford.—PROPOSED E.L.—The Warwick R.D.C. has passed the plans of a local company for an electric lighting scheme for Barford. Mr. Smith Ryland is to be chairman of the company, and overhead mains are to be used.

Bolton.—The annual report of Messrs. Tootal, Broadhurst, Lee & Co., cloth manufacturers, states that the change from steam to electric power at their mills in Bolton has been completed, and the results, both from a working and an economical point of view, are satisfactory.

Bradford.—The B. of G. has appointed a sub-committee to consider the advisability of converting the exterior lamps from gas to electricity.

Cleckheaton.—BOARD OF TRADE REPORT.—A B. of T. report has just been issued upon an inquiry held by one of its surveyors with reference to the bursting of a feed delivery pipe at the electricity works in April last, whereby a stoker was seriously scalded. The report states that the casting appears to have been defective, and that if a suitable hydraulic test had been applied the latent defect would have been discovered.

As the Yorkshire E.P.S. Co. has offered a supplementary supply of electricity in bulk, the T.C. has deferred the scheme recently adopted for the extension of its electricity works, at a cost of £8,500, with the exception of additional switchgear and feeders.

Clones.—E.L. INAUGURATED.—The inauguration of the electric lighting of Clones took place last week at the power house of the Clones Electric Light and Power Co. Centrally-suspended clusters of lamps are used in the main streets, and the side streets are lighted by single lamps suspended from brackets clamped to the poles carrying the wires.

Deal and Walmer.—E.L. SCHEME.—A Joint Committee of the Deal T.C. and the Walmer U.D.C., after instructing Mr. E. M. Lacey to report upon the E.L. question for the two towns, asked Mr. Lacey if, owing to the war, he would agree to the instructions being withdrawn. Mr. Lacey replied suggesting that the instructions be postponed until the Committee considered the conditions sufficiently normal. The Joint Committee referred the matter to the respective Councils, and the Deal T.C. has decided to instruct Mr. Lacey to proceed with his investigation, leaving the Walmer U.D.C. to co-operate if it so desires.

Farnborough (Kent).—MAINS EXTENSION. — The West Kent E.L. and S. Co. has informed the Bromley B. of G. that it will shortly be extending its mains to Farnborough, and would be prepared to supply electricity to the Board's workhouse and infirmary.

Holmfirth.—PROPOSED NEW GENERATING STATION.—The D.C. has decided to apply to the B. of T. for sanction to construct a generating station at Newtown, in connection with the Holmfirth E.L. Order, 1912.

India. — Calcutta Electricity Charges. — The Calcutta Trades Association has approached the Bengal Public Works Department with a view to a reduction in the charges for electricity. The present charges are 8 annas (= 8 pence) per unit for lighting, and 4 annas per unit for fans, with a discount of 25 per cent. for prompt payment, compared with 4½ annas per unit for lighting, and 4½ annas, less a monthly discount of 1 per cent. on every 250 units used, with a maximum of 35 per cent., and also a rate of 4 annas per unit for residential premises, for power, in Bombay. In Calcutta it is necessary, in order to obtain the lower rate for fans, to have the premises wired separately for lighting and power, and to install two meters. The meter rent of Rs. 12 per annum is also objected to. The Association suggests a maximum charge of 4 annas per unit, with a discount of 25 per cent. for prompt payment, for all purposes, and considers that where more than one meter is installed, a charge of 8 annas per meter per mensem would be sufficient. The company has since reduced the charge for lighting by ½ anna per unit, but the Association considers this altogether inadequate.

The application of the Madras Electric Supply Corporation, Ltd., for permission to introduce the alternating-current system into the city in addition to the existing three-wire direct-current system has received the sanction of the Madras Government, which has also accorded sanction to a change of frequency from 25 cycles, as at present authorised, to 50 cycles per second.

Kingston-on-Thames. — L.G.B. Inquiry. — A note appeared under this heading in our last issue referring to proposed extensions of cables and the erection of a transformer sub-station; we regret to learn from Mr. J. E. Edgcome, borough electrical engineer, that the particulars were wholly incorrect. No special extensions of mains are in prospect in connection with his undertaking.

The note, we find, should have referred to Wimbledon, and is reprinted under that heading to-day.

Llandudno.—Street Lighting. — The U.D.C. has deferred further consideration of a report on the suggested electric lighting of Mostyn Broadway.

Maidstone.—Sale of Plant.—The T.C. has sold one of the original 150-kw. sets at the electricity works to the military authorities for £750, exclusive of all charges for removal, and the set has gone to Egypt.

Supply to Tramways.—The price of energy for the tramways, from April 1st last, has been fixed at 1½d. per unit, subject to revision in case of any alteration in the price of coal.

Portrush.—E.L. Scheme.—The U.D.C. has adopted the report of Messrs. John Woodside & Co., of Belfast, with reference to the proposed electricity supply works. The engineers have been directed to proceed with it immediately, and it has been decided to apply for a loan of £8,000.

Saddleworth.—E.L. and Tramways Extensions.—As the result of a conference between the Saddleworth D.C. and the Stalybridge, &c., Electricity Board to consider an extension of the tramways from Mossley to Greenfield, and the supply of electricity for lighting purposes to Saddleworth, it is proposed to seek powers to extend the tramways and to supply electricity.

Shipley.—Street Lighting and the War.—Owing to the scarcity of carbons, the U.D.C. has instructed the electrical engineer to replace the arc lamps in the streets with metal-filament lamps.

Todmorden.—Loan Sanction.—The L.G.B. has sanctioned the T.C.'s application to borrow £1,000 and £200, for the purposes of the electricity undertaking.

Whitstable.—Overhead Wires.—The E.L. Co. has applied to the B. of T. for permission to use overhead wires throughout the urban district for the supplying of electricity at 230 volts.

Widnes.—L.G.B. Inquiry.—An inquiry was held on August 25th into the application of the T.C. for a loan of £6,300, for a refuse destructor. There was no opposition.

Wimbledon.—L.G.B. Inquiry.—An inquiry was held on August 20th into the application of the Council for a loan of £8,500 for two extra-high-pressure cables and the erection of a transformer sub-station. There was no opposition.

TRAMWAY and RAILWAY NOTES.

Argentina.—The Government of the Province of San Juan has approved the plans presented by the constructing syndicate for a tramway system connecting the city of San Juan with the surrounding suburbs.—*Review of the River Plate.*

Sheffield.—Annual Accounts.—The total revenue of the Corporation Tramways undertaking for the year ended March 31st last was £392,397, against £364,903 in the previous year. Working expenses amounted to £232,761, against £207,690, and, after paying interest and sinking fund, £78,723, and income-tax, £3,306, there was a balance of £77,608, of which £30,123 was placed to the renewals fund and £30,582 to the relief of the rates. The car-miles run totalled 8,883,576, against 8,071,188, and the passengers carried numbered 104,851,408, against 96,330,242. The department generated 18,601,705 units, against 16,500,208, and also purchased 207,655 from the Electricity Supply department. The total cost per unit was ·679d., against ·673d., and the energy used per car-mile averaged 1·933 units, against 1·873. The average total revenue per car-mile was 10·527d., against 10·760d., while the total working expenses per car-mile were 6·79d. (including power, 1·39d.), against 6·654d. (power, 1·325d.). The cost of fuel increased from £17,216 to £21,738. The Corporation's motor-omnibuses showed an income of £9,128, and a working expenditure of £5,974. After paying interest, sinking fund, and income-tax, and allowing £1,360 for depreciation, there was a balance of £1,271, which was transferred to a special reserve fund.

U.S.A.—The New Orleans Dock Board has closed a contract for energy supply to six electric trucks for haulage service on the water front, after a careful test of their merits. The docks are to be equipped with an electric conveyer system.—*Electrical World.*

TELEGRAPH and TELEPHONE NOTES.

Argentina.—The Ministerio de Marina has given instructions for the erection of two additional wireless stations at Iguaza and Posadas respectively. Both stations will be of power sufficient to communicate with Paz (Entre Rios) and Darcena Norte, and in conjunction with the existing stations at Puerto Militar, Cabo Virgenes and the Island of Ano Nuevo, provide a complete wireless system throughout the Republic.

Canada.—The capitalisation of telegraph companies operating in Canada for the year ended June 30th, 1913, as reported by the companies, was $202,468,041, of which $160,342,873 was in stocks, and $42,125,168 in funded debt, these figures being practically the same as in the previous year. The total revenue was $6,095,212, an increase of $879,041, and the expenses were $4,034,480. The ratio of operating expenses to gross revenue was 66·84, as compared with 65·83 for the year 1911-12. The wire mileage for the year was 152,918, against 167,939 miles in the previous year. The number of land messages transmitted was 11,176,753, against 9,252,540 in the previous year, and cablegrams sent were 877,534, against 768,559. The number of employés was 6,006, against 4,828, and salaries and wages cost $2,962,159, against $2,703,032.—*Canadian Railway and Marine World.*

Panama.—The Government telegraph and telephone services of the Republic are to be improved, an appropriation of $143,350 having been made for that purpose.

United States.—Both Germany and Great Britain have accepted proposals that the wireless stations at Tuckerton (New Jersey) and Sayville (Long Island) should be permitted to send code messages to belligerent countries, subject to the censorship of the American naval authorities.

Wireless and the War.—According to the *Financial Times*, the sinking of the *Kaiser Wilhelm der Grosse* by the *Highflier* was attributable almost entirely to the fact that the British Navy had free and unfettered use of wireless telegraphy, while the German stations at Togoland and Dar-es-Salaam had been destroyed. The part played by wireless telegraphy in the present European struggle has been most important from the outset, and our superiority in this respect is likely to make itself felt with still greater effect before the war is over, particularly in connection with the strategic movement of the troops.

West Indies.—An agreement dated August 10th has been concluded by the Imperial and Canadian Governments and the Crown Agents of the West Indian Colonies and the West India and Panama Telegraph Co., Ltd., whereby, in return for a subsidy of £16,000 per annum for ten years, payable in equal shares by the Imperial and Canadian Governments, and the continuance for the same period of subsidies amounting to £10,300 per annum already paid by the West Indian Colonies, the company undertake largely to reduce the cable rates at present in force. There will be a flat rate for messages between any of the Colonies and the United Kingdom of 2s. 6d. per word, and 1s. 6d. per word in the case of Canada, in place of rates varying from 3s. to 5s. 6d. and 2s. 2½d. to 4s. 9½d. Corresponding reductions are made for inter-Colonial messages.

If in any year after the first four the company's revenue exceeds £74,000, a sum equal to one-half of such excess (up to a revenue of £106,000) is to be deducted from the Imperial and Canadian subsidy payable in respect of the next year; while if it exceeds £106,000, a sum equal to one-half of such excess (up to a revenue of £126,600) is to be deducted *pro rata* from the Colonial subsidies. Furthermore, if in any year after the first four the revenue exceeds £126,600, reductions in the current rates of charge are to be made.

Provision is made for the effectual working of the company's existing system; for a reduction of 50 per cent. in the charges for Government and Press telegrams and for priority for Government telegrams; for the acceptance of deferred telegrams at a reduced rate; for the maintenance of the British character of the company; for the supply to the Colonies free of charge of daily news bulletins—especially as to matters chiefly affecting British and Colonial interests; and for penalties in the case of interruptions.—*Daily Telegraph.*

CONTRACTS OPEN and CLOSED.

OPEN.

Aberaman.—September 9th. Electrical goods, for the Powell Duffryn Steam Coal Co., Ltd. Stores Manager.

Australia. — SYDNEY. — September 30th. Telephone instruments and parts, for the Postmaster-General. See "Official Notices" August 21st.

October 7th. Telegraph instruments, measuring instruments, incandescent electric lamps, switchboard parts, for the Postmaster-General. See "Official Notices" August 28th.

MELBOURNE.—Victorian Railways Department. October 7th. Motors and switchgear, and motor-driven air compressors for the Ballarat and Bendigo workshops.

September 22nd. P.M.G.'s Department. Ten tons twisted-pair wire.

October 12th. Three-phase motors for workshop machinery, for Melbourne Suburban Railways. See "Official Notices" to-day.

BRISBANE.—December 15th. C.B. multiple switchboard, automatic or semi-automatic.—*Aus. Mining Standard.*

KALGOORLIE.—Five-ton electric wagon, for Municipal Council. Specifications, &c, may be seen at the Commercial Intelligence Branch of the Board of Trade.

Birmingham.—September 7th. Coal (173,000 tons) for the Corporation Electric Supply Dept. Mr. R. A. Chattock, City Electrical Engineer and Manager, 14, Dale End.

Burnley. — September 21st. Guardians. Electrical goods and the performance of electrical work during the next half-year.

Clayton (Bradford).—September 7th. Electric lighting installation, for the Guardians of North Bierley Union. Specifications from Messrs. J. Harper Bakes & Sons, Calverley Chambers, Leeds.

Eccles.—September 21st. Coal elevator and conveyor at the electricity works, Cawdor Street, Patricroft. Specifications, &c. (£1 1s.), from the Borough Electrical Engineer.

Huddersfield.—September 9th. West Riding Asylums Board. Electric lighting, telephones, bells, &c., at the new chronic blocks, Storthes Hall Asylum, Kirkburton, near Huddersfield. Particulars from Mr. W. E. H. Burton, Engineer to the Board, West Riding Asylum, Wakefield.

Limerick.—September 18th. Corporation. One three-cylinder Diesel oil-engine coupled to a 160-KW. D.C. generator; one motor-driven air compressor. See "Official Notices" to-day.

London. — L.C.C. — September 8th. Cables, H.T. and L.T., and laying stoneware ducts (tramways). See "Official Notices" August 7th.

September 8th. Reconstruction of motor-generators in the tramway southern sub-stations. See "Official Notices" Aug. 14th.

September 22nd. Induced-draught fans, motors, spare parts and dampers, also alteration of flues and moving of dampers at the generating station, Greenwich. See "Official Notices" August 28th.

ST. PANCRAS.—September 21st. Electric lift for heavy vehicles, for the B.C. See "Official Notices" August 28th.

Manchester.—September 15th. Supply and erection of steel storage shelving in the Stores Dept., Hyde Road car depôt, Manchester. Mr. J. M. McElroy, General Manager, Corporation Tramways, 55, Piccadilly, Manchester.

September 15th. Uniform clothing and caps. Specifications from Mr. J. M. McElroy, as above.

Middlesbrough.—September 12th. Corporation. Three electric motor-driven sewage pumps, priming pumps, metering arrangement, pipework, overhead travelling crane. See "Official Notices" August 14th.

New Zealand. — WELLINGTON. — September 8th. (1) 3,000 wall telephones, (2) 50, or more, telegraph typewriters, (3) 6 tons of copper binding wire, (4) 5 tons of galvanised-iron binding wire. Specifications, &c., may be seen by United Kingdom manufacturers at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.—*B. of T. Journal.*

Spain.—JARAIZ (CACERES).—December 5th. Concession for the urban and suburban lighting of the town (594 lamps). The present contract with the Sociedad Electro Industrial Anton Martinez Herraiz expires on December 5th. Prospective tenderers are informed that within 6 or 8 kilometres' distance private waterfalls exist, which may be acquired for the provision of current for public and private lighting and industrial purposes.

Salford.—Steel rails, points, crossings and tie-bars, for the Tramways Department. General Manager, 32, Blackfriars Street.

South Africa.—JOHANNESBURG.—October 9th. Ten single-truck double-decked electric tramcars, for Municipal Council. Specifications, &c., may be seen at Commercial Intelligence Branch of Board of Trade.

Warrington.—September 11th. Education Committee. Wiring, &c., at the Evelyn Street Council School. Mr. J. Moore Murray, Secretary and Director, Education Office, Sankey Street, Warrington.

September 15th. 12 months' supply of earthenware conduits for Tramways Committee. See "Official Notices" August 28th.

Whitby. — September 30th. U.D.C. Construction of cliff tramway or lift. Particulars from the Clerk to the Council.

Wolverhampton. — September 8th. Construction of tramway permanent-way, Bilston Road, for the T.C. Mr. George Green, Borough Engineer (returnable deposit of £1 1s.).

September 15th.—B. of G. Electrical fittings, &c., for the Board of Guardians. Forms of tender from Mr. F. Harrison, Clerk to the Guardians.

CLOSED.

Bradford.—The Electricity Committee on Tuesday cancelled the contract for the 5,000-KW. turbo-generator of the Bergmann Elektricitäts-Werke A.G., Berlin, and transferred the order to the British Westinghouse Electric & Manufacturing Co., from whom, the committee state, they have obtained very satisfactory terms. The amount of the original tender was £9,370 The Bergmann generator was almost completed in Berlin.

London.—The Edison & Swan United Electric Light Co., Ltd., have received a contract for 12 months' supply of Standard-type "Royal Ediswan" drawn wire, and also carbon and special-type lamps, for H.M. Office of Works.

Manchester.—Messrs. Chamberlain & Hookham, Ltd. have received the contract for the supply of meters to Manchester.

Salford.—The following tenders are recommended to the Town Council for acceptance :—

Babcock & Wilcox.—Steel steam-pipes for 5,000-KW. turbo-alternator, £88.
J. Wolstenholme & Son.—Cast-iron pipes for 5,000-KW. turbo-alternator £180.
British Westinghouse Electric and Mfg. Co.—Switchgear equipment to two 750-KW. rotary converters, £275.
G. & J. Weir, Ltd.—One steam turbine-driven boiler feed pump, £235.

Stalybridge. — The Joint Tramways and Electricity Board has accepted the tender of Messrs. S. Robinson & Sons, Hyde, for new offices and stores at the generating station.

Warrington.—The Electricity and Tramways Committee is recommending the Council to accept the following tenders :—

St. Helens Cable and Rubber Co., Ltd.—Cable, £1,658.
British Thomson-Houston Co., Ltd.—Extra-high-tension feeder pane £113.
Drake & Gorham, Ltd.—Low-tension feeder panel, £42.
Scottish Tube Co., Ltd.—Steel tramway poles, £83.
W. & J. Richardson.—5,000 tons of coal.

FORTHCOMING EVENTS.

Association of Mining Electrical Engineers (North of England Branch).—Saturday, September 5th. Visit to Felling Colliery and Garden Party at Wardley Hall.

London Association of Foremen Engineers.—Saturday, September 5th. At 7 p.m. At Cannon Street Hotel. Paper on "Railless Electric Traction," by Mr. W. E. Ireland.

Salford Technical and Engineering Association.—Saturday, September 5th. At 7 p.m. At Royal Technical Institute, Peel Park. Paper on "Centrifugal Pumps for Salvage, Sewage and Gravel," by Mr. A. W. Taylor.

Institution of Mining Engineers.—Wednesday, September 9th. At 10.30 a.m. At the Central School of Science and Technology, Stoke-on-Trent. Annual General Meeting. (Dinner, visits to works, &c., are cancelled.)

Institute of Metals.—Thursday, September 10th. At 4.30 p.m. At Caxton House, Westminster. Annual General Meeting.

NOTES.

A Siemens Resignation.—Mr. C. Koettgen has tendered his resignation, which has been accepted, as a director and as managing director of Siemens Bros. Dynamo Works, Ltd., and has no further connection with the company.

Electrical Destruction of Pests.—A recent article in the *Electrical World* describing a device adopted by the employés of a Fort Wayne, Ind., electric light station for disposing of rats by making them auto-electrocutionists, recalls a patent issued a few years ago for destroying smaller pests. In the Fort Wayne invention the rodents are lured upon a metallic base by a piece of cheese suspended above it on an iron prong, the two being connected with opposite poles of a 110-volt circuit; the result to a hungry and enterprising rat is obviously disastrous. In the patent referred to the "bugs" were supposed to be lured (bait not stated) upon a grill or network of wires of alternate polarity, which put the said bugs out of commission in short order. These inventions are being recommended to all American up-to-date central station managers as worthy of consideration in increasing their off-peak load!

Patents of Enemy Subjects.—Mr. Runciman, in moving the second reading of the Patents, Designs and Trade Marks (Temporary Rules) Act (1914) Amendment Bill, explained that the Bill would not confiscate the property of alien patent owners. The object was to suspend and not to destroy. If, at the end of the war, Germany and Austria agreed to keep alive patents held by British subjects in those countries, we, on our part, would be prepared to keep alive patents in this country of German and Austrian subjects. Power, however, was taken to issue licences to British subjects to exercise alien patents not only for the period of the war, but for the full period of the patent. The Bill passed through Committee, and was read a third time.—The *Times*.

Late Correspondence.—Since our "Correspondence" pages went to press, we have received a number of other communications, which, owing to the immediate interest of the matter with which they deal, we insert notwithstanding our usual rule:—

ELECTRIC COOKING APPARATUS.

Mr. Ptah is evidently a reincarnation of one of those Egyptians whose internal arrangements he so graphically describes.

It would be immensely interesting to learn why they injected a fluid into the oil chamber which, I presume, in those old days, was the progenitor of the modern stomach.

I feel confident, however, that the Egyptian must have been greatly relieved when he lost his oil chamber and dissolved element, unless he happened to have been casually sucked out through the vent with them, and unless he had gone before in this manner it must have been a great relief to him to be dead.

Doesn't Mr. Ptah's Egyptian oil experience confirm the preservative effects of oil? We coat metals with oil to prevent oxidisation, because oil contains no free oxygen. Rapid convection prevents excessive temperature. Over three years' trial no element has failed, and there isn't the slightest reason why the elements shouldn't last as long as the mummies.

R. F. S. VENNER.

THE CRISIS AND PROVISIONAL ORDER NOTICES.

Would it not be advisable under the present crisis to request the Board of Trade to waive the necessary notices, other than the formal notices already given for Provisional Orders, for the supply of electricity in the different areas?

This would not only make work for English manufacturers, but would make work in other directions, as well as putting more money in circulation; even if the capital had to be raised at a larger rate of interest, it would still be more economical, as the poor rate in the districts would not suffer so greatly.

I should be very pleased to give my services to any such movement, but would suggest that it should be done through the Institution of Electrical Engineers.

R. W. ROWLAND-HILL.

Pinner, *September 2nd*, 1914.

WHAT CONSTITUTES A BRITISH FIRM?

May I be allowed to express in the strongest possible manner my complete disagreement with what is said by a member of a well-known firm of consulting engineers, under the above heading, in your issue for the 28th ult.? Your correspondent is anonymous, but I, at any rate, have sufficient belief in my opinions to write over my own name.

Your correspondent—and I fancy I know who he is, and believe him to be actuated by the best intentions—has no sense of proportion. He would put personal feelings and gratitude for past scientific services before patriotism, and this at a moment when this country, and, indeed, our whole European civilisation, is in the direst danger. This is certainly not a time to discuss the merits of the Siemens family, which all who know will readily admit; but to talk of "malicious tongues" when we declaim against our barbarous enemy is surely monstrous.

What are the facts? I append a list of the shareholders in Siemens Brothers & Co., Ltd., which I have obtained from Somerset House. As will be seen, 60 per cent. of the shares are actually held by Germans in Berlin, while of the remainder much the greater portion are in the hands of two Germans who are only English by naturalisation, in one case acquired, as I am informed, only a week or two ago.

The position of a foreigner made English by naturalisation must always be a dubious one, and I have sufficient respect for Mr. Alexander Siemens to believe that he must retain considerable sympathy for the land of his birth.

The board of directors of Siemens Brothers & Co., Ltd., is also preponderatingly German. The chairman is of that nationality, as also two other of the directors, while the board contains only one born Englishman.

In the case of the Siemens Brothers Dynamo Works, Ltd., the position is probably similar, though, owing to the fact that 19,993 of the 20,000 £10 shares which have been issued appear to be in the hands of trustees, it is impossible to say how the shareholding is split up.

Under these conditions, I say unhesitatingly that any Englishman who gives new work to either of these two companies is acting in an unpatriotic way. Nay, more, as it seems to me under the Royal Proclamation of August 5th, he is acting illegally, as this Proclamation contains a clause to the following effect:—

"Nor to enter into any new commercial, financial, or other contract or obligation with, or for the benefit of, any person resident, carrying on business, or being in the said (German) empire."

This description covers the whole of those members of the Siemens family who live in Berlin and own 60 per cent. of the company's share capital.

Quite apart, however, from the commercial and legal points of view, there remains the outstanding fact that the bulk of the shares in these Siemens companies are owned by our German enemies, citizens of a country which has apparently relapsed into the most atrocious barbarism, whose army is a horde of marauding murderers, whose most eminent professors teach doctrines of undiluted non-morality, whose Chancellor tears up as a matter of no concern a solemn treaty entered into by his country, which he sneers at as a mere scrap of paper, laying down the appalling doctrine that necessity knows no law, and whose Emperor has publicly inculcated wholesale massacre in the giving of no quarter to prisoners of war.

It is impossible for any Englishman to defend doing business with companies which are controlled by, and whose shares are principally owned by, citizens of a nation of criminal savages—very devils who are only restrained by the silver sea and by our own naval preponderance from wreaking on us here in England the unparalleled atrocities they have been perpetrating on the unfortunate and entirely innocent people of Belgium.

A. A. CAMPBELL SWINTON.

London, S.W., *September 2nd*, 1914.

SIEMENS BROTHERS & CO., LTD.

Capital, £600,000 in £5 shares.	Shares.	
Antill, B. H., London	100	
Von Chauvin, G., Bromley...	19,210	
Dieselhorst, Wilhelm, Charlton	200	
Easton, J. J., Sutton	200	
Grimston, G. S, Blackheath	100	
Hager, Carl, Charlton	200	
Hird, Frances, Charlton	120	
Huddleston, J. S., Blackheath	200	
Jacob, Frank, Blackheath	300	
Lauckert, Edward, Charlton	200	
Lawrence, Sir W. Roper, Eaton Square ...	8,045	
Loeffler, H., Kensington	20	
Siemens, Alexander, Westminster... ...	19,783	
Von Siemens, A. W. & G. W., Berlin ...	23,282	
" " " ...	33,034	
" Carl F. & A. W. " ...	13,249	
" A. W. " ...	300	70,782
" G. W. " ...	300	
" Carl F. " ...	300	
Exors. of Von Siemens, Carl H., Berlin ...	317	
Straube, Albert, Hampstead	140	
Wheeler, W., Westminster	400	
	120,000	

As will be seen, 60 per cent. of the shares are actually held in Berlin, while of the remainder the greater portion are in the hands of two Germans, who are only English by naturalisation.

A. A. C. S.

America and the War.—In an editorial in the American *Electrical Review*, dated August 15th, entitled "Some Principles of Foreign Trade," our contemporary says:—

"During the past two weeks, while the war cloud thickens abroad, economists on both sides of the water have had a good deal to say with regard to the possibilities of the manufacturer in the United States participating to a greater degree in the commerce and trade of those countries heretofore almost entirely dependent upon either England, Germany, Italy, France or Russia for their larger supplies of fabricated material. It seems reasonable to presume that if the foreign workshops are shut down for any considerable period, and with practically all of the sea-going nations abroad in a belligerent attitude, the exports of those countries must shrink very materially. With no selfish spirit then, it would seem to be the opportunity and the right of the manufacturers in the United States to see to it that if such a market be available, information of a most accurate nature respecting requirements and methods of doing business be secured as expeditiously as possible. In this contingency the records of the Bureau of Foreign and Domestic Commerce are available to our manufacturers, and the Chamber of Commerce of the United States of America is also in a position to help materially. While spasmodic efforts have been made by some manufacturers to develop business with the Latin-American countries, China, Japan and Asia, comparatively little is known in the aggregate either with regard to the requirements of the people there or their methods of doing business. It is a fact that in these places the American manufacturer has done a good deal to discourage dealing with this country because of an inequitable and vacillating policy with respect to his handling of orders and his desire to secure this business. When conditions in the United States have been depressed there has been a mild stampede to the other countries and orders have been booked enthusiastically. When, however, conditions have improved so that the factories are busy, it has not been the exception in the past to find the business so ardently solicited one year, scorned the next, and the contractor or builder or promoter in those countries has consequently sometimes been left in the lurch when refitting, rehabilitation or extension became necessary.

"Where United States manufacturers have made a study of conditions in Asia and in countries similarly situated, with regard to our possible trade extension, they have met with considerable success. A knowledge of the way to do business in those countries, however, is not easily secured and not at all in a single season. The Government departments are organised for team

work and co-operation with the Chambers of Commerce of the progressive cities of the United States. It is a well-known contention among the officers of the Bureau that the manufacturers of the United States do not utilise their organisation to anything like the extent that they should. Here, then, is a possibility for trade expansion that should have attracted the intelligent attention of manufacturers, even in a time of keen competition with the manufacturers abroad. Now, when because of the unfortunate unsettlement of industry abroad the opportunity of the manufacturer in this country seems forced to his attention, will it not be well to begin at once to realise upon the latent possibilities?

"Out of strife and struggle has always come the period of greatest development in this country. During the awful days of the Civil War, when the ports of the South were closed to the industries of the Northland, an entire readjustment of facilities and business became necessary. The commerce of the country was changed about, and in a miraculously short time native genius blossomed, and invention had its greatest opportunity. Chicago's supremacy as a grain centre of the world, her leadership in the packing industry, are the direct results of the courageous efforts of brave commercial captains to live up to the opportunities forced upon them through the closing of the ports of the South, and the city of Saginaw and other populous places now along the river came into being because of the increased industrial opportunities due to the development of the new business centres. Dispatches from Paris contain the report that the French Government has placed an order with Armour & Co. for 2,000,000 lb. of canned beef for army rations. Without considering now just how these supplies are to be shipped and delivered, in view of a close adherence to the neutrality laws, if such requirements as this are magnified many times, can anyone conjecture the expansion that should come to this country in its hour of peace, while the other nations of the world are at war with each other?"

Inquiries.—A correspondent asks for names and addresses of firms able to make machines for spirally covering asbestos cores with resistance wires.

Another inquirer asks to be put in touch with the manufacturers of papier-maché or similar bobbins for electrical coils, supplies of which have previously been obtained from Germany.

A further inquiry is for any British-made substitute for "Stabilit."

British makers of small primary cells for pocket lamps are asked for.

Institution and Lecture Notes.—THE SOCIETY FOR ELECTRICAL DEVELOPMENT.—The report of this American Society, recently issued, states that specimen wiring specifications have been distributed to architects, to show them how such specifications should be drawn up. Machine-tool builders are being urged to show their tools in the catalogues motor-driven, and to build the tools with motors as integral parts where such practice is desirable. The extension of facilities for charging electric vehicles, the improvement of electric heating and cooking appliances, the employment of small electrical refrigerating machines and electrical ventilation, and the development of the use of domestic electrical apparatus, are other directions in which the Society is working. A prize story competition has been organised, with a Committee of Award of high qualifications, the prizes offered ranging from £2 to £50, and a large amount of work is being done in connection with a publicity campaign, special booklets, &c. The education of window trimmers in the matter of effective lighting of show windows and shop interiors occupies a prominent place in the activities of the Society. A booklet recently published, is entitled "Vacation Comforts," and shows in how many and various ways the use of electricity conduces to the comfort and happiness of holiday-makers and others.

THE ILLUMINATING ENGINEERING SOCIETY (U.S.A.) holds its convention at The Hollenden, Cleveland, from September 21st to 26th.

THE ELECTRICAL VEHICLE ASSOCIATION OF AMERICA.—The annual convention of the Association is to be held in Philadelphia from October 19th to 21st. Among the papers to be read are one by Mr. J. H. McGraw on "The Progress of the Electrical Vehicle," one by Mr. W. P. Kennedy on "Electrical Vehicles in Parcels Post Service," one by Mr. F. C. Henderschott on "Educating the Public to the Field and Use of the Electrical Vehicle," and one by Mr. Walker, the chief of the Philadelphia Fire Brigade, on "Electric Fire Apparatus."

INSTITUTE OF METALS.—In consequence of the war it has been found impossible to hold the proposed Portsmouth meeting of the Institute of Metals on September 10th and 11th next. This meeting is, therefore, indefinitely postponed. In its place, however, a statutory meeting of the Institute will be held at Caxton House, Westminster, S.W., at 4.30 p.m. on Thursday, September 10th, when, beside the transaction of official business (which will include the nomination of officers for 1915, and the election of members), there will be formally presented the nine papers that would have been read and discussed at the Portsmouth meeting.

Barcelona Exhibition.—It has been definitely decided to hold this Exhibition in 1917. The Spanish Cortes has voted 10,000,000 pesetas, and the Ayuntamiento of Barcelona a similar sum in aid of the undertaking, which, however, it is expected, will require a sum of 70,000,000 pesetas for its realisation. The organising committee are now considering the means of raising the balance.

Lamp Carbons Dispute.—A motion in an action of the Beck Engineering Co., Ltd., and Billington *v.* the Foster Engineering Co., Ltd., and Sloan Electrical Co., was before Mr. Justice Shearman in the Vacation Court on Wednesday. It related to a quantity of lamp carbons which were the subject of an agreement between the parties and Mr. C. Conradty, the manufacturer. A reference to these carbons appeared in our "Legal" section last week.

Mr. Collingwood appeared for the plaintiffs and Mr. Colefax, K.C., and Mr. Julian Fuller for the respondents.

At the outset Mr. Colefax explained that the plaintiffs had obtained an injunction *ex parte* relating to 10,000 of the carbons, part, it was said, of 180,000 or 200,000 in this country, and he should ask that that injunction should be dissolved, though he was willing to make the plaintiffs an offer in respect of the carbons they required.

Mr. Collingwood, however, said that he could not accept the offer. His present motion was that a Receiver should be appointed of the carbons in dispute, but he should ask for an adjournment to file evidence in reply. The motion was before the Court the previous week, when it stood over for the defendants to file evidence, and the evidence for the defence was not handed to the plaintiffs until after 4 o'clock the previous evening. He had had no opportunity of seeing it.

His Lordship asked what was the plaintiffs' title to the carbons. After a full hearing, his Lordship said that he could not see that the plaintiffs had made out that these carbons were their property earmarked to them, and he would dissolve the injunction as to the 10,000 and the rest of the motion, and all questions as to costs would stand over for a week to answer the affidavits. The defendants had expressed their willingness to execute any orders they might receive at current prices, and any dispute as to price could be determined later.

Appointments Vacant.—Junior switchboard attendant (£70) for Swansea Corporation; meter superintendent for Hull Corporation (£150); overhead lineman for Colombo (age, 30) for Colombo Electric Tramways and Lighting Co., Ltd.; shift engineer for A.C. and D.C. (30s.), for Ayr Corporation; temporary sub-station attendants are wanted for Sunderland to take the place of men serving with the forces. Particulars are given in our advertisement pages.

German Firm in Court.—In the City of London Court, on Wednesday, Hagen Accumulator Works, 15, Holborn Viaduct, sued F. L. Mitchell & Co, Ltd., electrical engineers, 188, Rye Lane, Peckham, for £3 16s. 4d., for accumulators and batteries supplied. The defendants' representative said they admitted having the goods from Germany, but their trade had been diminished by 75 per cent., and, even if they were liable, they said they ought not to pay, because the plaintiffs were a German firm. Judge Rentoul, K.C., wanted to know how he was to find out if the plaintiffs were a German firm. The defendants' representative said the plaintiffs advertised to that effect in the trade journals. The plaintiffs' representative said they were a German concern right enough, and he was only proceeding with the case to save the Court's issuing fees. Judge Rentoul said the case would be adjourned until the end of the moratorium, whenever that might be.

Ceiling Roses.—The British Standard specification, No. 67, for two and three-plate ceiling roses, has been issued by the Engineering Standards Committee. The preface to the report explains that the standardisation of two and three-pin plugs and other accessories is being proceeded with, but it was felt that the convenience of those concerned would best be met by issuing separate specifications so as to bring the standardisation into force as soon as possible, rather than by waiting until the whole of the work was accomplished and then publishing simultaneously a complete set of specifications. The Committee has had the cordial co-operation of the British Electrical and Allied Manufacturers' Association, so that these standards are likely to be generally adopted by the industry, with considerable benefit to both makers and users. The report contains particulars of the material to be used, the dimensions of all the essential parts, the sizes and shape of the holes for the wires and all other necessary details. The Committee has specified that each terminal plate in the standard ceiling rose shall be of a different shape, the reason for distinguishing the different terminal plates by form rather than by colour being given in a note to the specification. Drawings showing the gauges necessary for both the two and the three-plate ceiling roses, and a diagram illustrating the relative positions of the terminal plates in a three-plate ceiling rose, are included. The price of this report is 5s. 2d., post free. It is published for the Committee by Messrs. Crosby Lockwood & Son.

Educational Notes.—We have received the prospectus of the South-Western Polytechnic Institute, Manresa Road, S.W., for the session 1914-15.

UNIVERSITY COLLEGE, London.—A course of 12 lectures on "The Theory and Practice of Radiotelegraphy" will be delivered by Prof. J. A. Fleming, F.R.S., on Wednesdays, at 5 p.m., beginning October 28th, 1914. The course will be in two parts, six lectures before Christmas and six between Christmas and Easter. It is open to both members and non-members of the University. Application for tickets of admission should be made to the Secretary.

Electrical Canal Tow-Boat.—In order to do away with "legging"—men pushing with their feet against the roof and sides—of the Harecastle Tunnel on the North Staffordshire Canal between the Potteries and Runcorn, the North Staffs. Railway Co. has installed an electric towing boat to tow the canal barges. As the water is too shallow for a propeller, and the roof too low for a trolley wire, four steel ropes have been laid through the tunnel, and these pass through the bottom of the boat and round two electrically-driven grooved wheels. The power is provided from a special barge, holding 150 cells, and capable of discharging sufficient current to meet the demands of several journeys. The cells are charged by a special plant at one end of the tunnel—which is 2,900 yards long—and while one accumulator barge is in use another is being charged. By this means 17 boats, each carrying 20 tons, can be towed through in about 40 minutes, whereas the journey used to take each boat from two to four hours. The boats have been constructed by Messrs. Bullivant & Co., Ltd., of Millwall, and the scheme has been carried out under the direction of Mr. A. F. Rock (chief electrical engineer to the N.S. Railway), Mr. F. A. L. Barnwell and other officials.

Fatalities.—Indian Shock Fatality.—An inquiry was recently held into the death of a Brahmin from contact with a broken telephone wire which fell across the Bombay Electric Supply Co.'s overhead lines. The latter consisted of five wires arranged one over the other, the top and bottom ones being earthed guard wires. The telephone wire was suspended between a bungalow and a tree, crossing above the power lines, and snapped at both ends of the span; one end apparently dangling over a small branch, which prevented its falling on the guard wire, touched the live power lines, while the other end fell into the road and killed the man. The tree branch from which the wire was suspended was 9 in. thick, and the jury came to the conclusion that the wire broke owing to the tree swaying in a high wind.

Salford.—Last week an inquest was held on James Wm. Hacking (16) who had been employed as an apprentice by Messrs. Eckstein, Heap & Co., electrical engineers, of Caroline Street, Lower Broughton. From the evidence it appeared that on July 10th the deceased got on a stool to fit brushes on to the switches, and the stool gave way. Hacking caught hold of a switch, which gave way, and he fell to the ground with the switch on top of him. He told a fellow workman that he had not hurt himself beyond bursting his thumb, but he was seen to be limping. He went on working, but two days later became ill, and a doctor who was sent for said he was suffering from blood poisoning. He died on August 20th at the Salford Royal Hospital. The medical evidence was that death was due to a state of septic poisoning brought about by an injury to the leg. "Accidental death" was the verdict.

Electric Heater for Oil Wells.—In the oilfields of the Whittier district, California, experiments are being made with an electric heater with a view to increasing the output of flowing oil wells. The heater consists of a long brass cylinder containing numerous coils, which is lowered to the bottom of the oil well, and the resulting increase of flow is considered as due to the expansion of gas causing a greater upward pressure. The heater, which is loaded with 9 kw., will, if successful, be a source of considerable income to electric companies in the locality.—*Electrical World.*

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Mr. S. Seal, of Hull, has been appointed meter and electrical testing superintendent to the Salford Corporation, at a commencing salary of £150, rising to £200 per annum, Mr. E. F. Kent, of Sunderland (see Elec. Rev., August 7th), having withdrawn his application for this post.

The Cleckheaton Electricity Committee has decided to advance the wages of Mr. H. Atherton, of the engineer's staff, to £2 5s. per week and to pay him £5 in respect of overtime.

Tramway Officials.—At St. Paul's Church, Leyton, on August 22nd, the marriage took place of Mr. John Fayle, traffic superintendent of the Leyton tramways, and Miss Ethel Jessie Trace, daughter of Mr. J. Trace, of Leyton. The presents included gifts from the tramway staff.

General.—Mr. H. Clifford Palmer (manager, publication department, General Electric Co., Ltd.), has recovered from the effects of a serious operation, and, as a lieutenant in the London Scottish Regiment, is now actively engaged in military duties.

Mr. T. A. Fraser has resigned his position as manager of the cable and metals departments of the Electrical Co., Ltd., and will terminate his engagement at the end of November, after being associated with the firm for 13 years.

Mr. Herbert Wolstenholme, formerly of Pendlebury, who is in the London office of the Chloride Electrical Storage Co., Ltd., was married to Miss Amy Scott, daughter of Mr. and Mrs. R. C. Scott, of Tynemouth, on August 26th. The wedding took place at Christ Church, North Shields.

Mr. W. Vincent Edwards has been appointed engineer and general manager of the Hastings and District Electric Tramway Co., Ltd., as from the 1st inst. He has for some months past been in charge of the system as deputy manager during the illness of Mr. Thos. B. Holliday. Mr. Edwards was one of the first to join the electric traction branch of Messrs. Dick, Kerr & Co., and saw a good deal of service with them in various English and Continental towns. Subsequently he was in their London office for several years before moving down to the Hastings Co.

Mr. Ernest E. Sharp has joined the board of the Jackson Electric Stove Co., Ltd., and will act with Mr. Williams in the direction of the business. Though the company has hitherto devoted itself to large cooking equipments, it is now ready to go ahead with kettles, toasters, flat-irons, &c. Mr. Sharp's connection with the C. & H. meter and Venner time-switch business will not be interfered with in any way.

The *Times* states that the Postmaster-General has appointed Mr. E. Raven to be an Assistant Secretary to the Post Office, in place of Mr. H. S. Carey, C.B., promoted.

Mr. D. N. Scott will shortly be severing his connection with the Reason Manufacturing Co., Ltd., of Brighton, as secretary and accountant, which position he has held for the past seven years.

Obituary.—Mr. Herbert R. Hudson.—On Sunday, August 30th, at his residence, Penn Fields, Wolverhampton, the death took place of Mr. Herbert R. Hudson, A.M.I.E.E., A.C.G.I., chief designer to the Electric Construction Co., Ltd. Mr. Hudson joined the E.C.C. staff in 1907, and a little more than 12 months ago was offered, and accepted, the position of chief designer. Although an exceptionally young man for so responsible a post, his performance of its important duties has more than justified the confidence placed in him. A man of much personal charm, unassuming, a wise counsellor and an ever-ready helper, he was a great favourite throughout the works. Of fine physique, an athlete, excellent company and a wonderful singer, he was heart and soul in the recreative and festive sides of the E.C.C. affairs, and did much to foster that spirit of comradeship which is so valuable an asset in any large business concern. For some years he was a member of the Executive Committee of the Wolverhampton Engineering Society. The increasing pressure of his duties at the works led him to tender his resignation from that Committee, whereupon the Society paid him the compliment of electing him a vice-president. By his untimely end the electrical engineering profession has lost a man of fine achievement and finer promise; the Electric Construction Co. a loyal and highly-valuable servant; the E.C.C. staff and workmen a comrade and friend.

Lord Merthyr.—We regret to record the death, which occurred on August 27th, of Lord Merthyr, who, as Sir W. T. Lewis, in the course of a lengthy and successful career, was at different times president of the South Wales Institute of Engineers, the Mining Association of Great Britain, and the Iron and Steel Institute. He was born in 1837, the son of an engineer, and he rose from comparatively humble circumstances to a position of great power in the industrial world, among his other attainments being that of an authority on industrial arbitration.

Mr. Frederick Smith.—We very much regret to learn of the death, which occurred at Swinford Old Manor, Ashford (Kent), on August 27th, of Mr. Frederick Smith, managing director of Messrs. Frederick Smith & Co., Ltd., wire manufacturers, of Caledonia Works, Halifax, and of Manchester, also director of the London Electric Wire Co., Ltd. He was in his 66th year.

NEW COMPANIES REGISTERED.

Harvac, Ltd. (137,523).—This company was registered August 27th, with a capital of £1,000 in £10 shares, to carry on the business of manufacturers of household appliances, vacuum or pneumatic or other dusting and cleaning machines and motors to drive the same, &c. The subscribers (with one share each) are:—C. J. Harvey, Haverbrae, Bewdley Hill, Kidderminster, manufacturer; J. H. Heynes, The Hursles, Torton, near Kidderminster, secretary. Private company. The first directors are C. J. Harvey and J. H. Heynes; solicitor, H. G. Ivens, High Street, Kidderminster.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Allen West & Co., Ltd.—Deb., dated August 10th, 1914, to secure £8,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holders: London County and Westminster Bank, Ltd., Lothbury, E.C.

Electrolite, Ltd.—Particulars of £1,500 debs., created August 5th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's property, present and future, including uncalled capital. No trustees.

Compagnie Des Cables Sud Americains (1,408).—Particulars filed August 25th. Registered in France. British address:—22, Royal Exchange, E.C., where E. L. Byng is authorised to accept service. No memorandum or articles of association filed yet.

John Davis & Son (Derby), Ltd. (66,606).—Capital, £35,000 in £1 shares (20,000 ord. and 15,000 pref). Return dated July 8th, 1914. 15,000 ord. and 11,000 pref. shares taken up. £1 per share called up. £26,000 paid. Mortgages and charges: Nil.

Central Wireless Co., Ltd.—Charge on company's undertaking and property, including uncalled capital, dated July 31st, 1914, to secure £150. Holder: Mrs. G. Scudamore, Mayford, Surrey.

Chesham Electric Light and Power Co., Ltd.—A memorandum of satisfaction in full on August 18th, 1914, of debs. dated January 27th, 1908, and September 25th, 1912, securing £10,000, has been filed.

Spanish Telephone Co., Ltd.—Capital, £81,000 in 5,600 ord. shares of £10 each and 1,250 pref. shares of £20 each. Return dated August 14th, 1914; 5,600 ord. and 671 pref. shares taken up; £20 per share called up on 671 pref. and £10 per share on 4,000 ord.; £53,420 paid; £16,000 considered as paid on 1,600 ord. shares. Mortgages and charges: Nil.

Dartmoor Electric Supply Co., Ltd.—A memorandum of satisfaction in full on August 13th, 1914, (*a*) of debs. dated March 15th, 1911, securing £500; (*b*) of "B" deb. dated August 22nd, 1913, securing £800; and (*c*) of debs. also dated August 22nd, 1913, securing £700, has been filed.

Particulars of £4,000 debs. created August 13th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

James Keith & Blackman Co., Ltd.—Issue on August 13th, 1914, of £700, part of a series of which particulars have already been filed.

Indian Electric Supply and Traction Co., Ltd. (84,233).—Capital, £547,986 in £1 shares; return dated April 30th, 1914, 78,021 shares taken up, £3,021 paid, £95,000 considered as paid. Mortgages and charges: £65,000.

D.P. Battery Co., Ltd. (44,084).—Capital, £10,000 in 4,996 "A," 4,996 "B" and eight other shares of £1 each, return dated July 8th, 1914; all shares taken up, £10,000 paid. Mortgages and charges: £12,000.

Harrow Electric Light and Power Co., Ltd. (44,529).—Capital, £50,000 in £5 shares (6,667 ord. and 3,333 pref.). Return dated March 12th, 1914; all shares taken up; £50,000 paid. Mortgages and charges: £26,325.

Eversheds & Vignoles, Ltd. (43,206 C).—Capital, £30,000 in £10 shares. Return dated July 9th, 1914; 3,000 shares taken up; £30,000 paid. Mortgages and charges: £15,000.

CITY NOTES.

Manaos Tramways and Light Co., Ltd.

The annual meeting was held on August 26th, at the offices, 9, Cloak Lane, E.C., Mr. G. M. Booth presiding.

The Chairman, in moving the adoption of the report, said they were holding the meeting under extraordinary and overshadowing circumstances. The world of finance and commerce was completely disorganised, and the future of all companies somewhat obscure. With them the obscurity was deepened by the problem of Brazilian exchange. As regarded the State debt for public lighting, their efforts to collect this had not met with any success, and, beyond a small payment in December last of less than £1,000, no payment had been made, and the amount of this debt to them at April 30th, 1914, was £33,898, and he feared present conditions would further postpone a settlement. The accounts for the year under review showed tramway receipts amounting to £87,029, against £106,148 for the previous year, a decrease of £19,119. The lighting receipts amounted to £44,395, as against £44,148 for the previous year, an increase of £247, the total gross income decreasing from £151,741 to £132,877. The total operating expenses decreased from £101,942 to £96,848 (the ratio of operating expenses to gross receipts had increased from 67·2 per cent. to 72·9 per cent.), and the net surplus had decreased from £28,107 to £14,426, or over 48 per cent. It was satisfactory to note that the lighting department was holding its own, and that it had not been necessary to write off anything from either of the company's reserves. The directors recommended the transfer of £8,000 to the contingencies and accident reserve account, making a total to the credit of the account of £23,725, and to the renewals reserve £6,000, making a total to the credit of the account of £27,000; the balance of £3,862 to be carried forward to next year's account. In the three months expired since the close of the year under review, the net earnings had decreased from £11,920 in 1913 to £5,764.

Mr. G. Watson seconded the resolution.

Mr. Hensley asked whether the ordinary reserve was invested in the business or separately. He also asked how the moneys which were owing by the State Government were treated in the accounts.

The Chairman said that with regard to the reserve fund, it was invested in the business. The amount owing by the Government appeared under the head of book debts and payments in advance in Manaos, £43,431. That included £33,000 due to them from the State. In addition, there was about £1,700 odd, which the municipality owed them, and there was something owing by the Federal War Department, on which sum small payments were being made on account. With regard to the future prospects of the Manaos rubber trade, on which the success of the company was almost entirely dependent, that was a very difficult question to answer, and it was one which the directors had been asking themselves for the past two years. It was very complicated, because they had the general problem of the success of producing rubber in the East cheaply, and the second problem which chemists differed upon was as to whether the quality of the fine, hard Para rubber was essentially superior to the Eastern rubber. At present there was a difference of about 9d. in the two prices. At anywhere near 3s. it was his own opinion that the Amazon would recover its own balance. He was also inclined to hope that the difficulties in the Amazon would lead to the production of more rubber and not less. That, again, was a speculation on his part, and the difficulty was that they were dealing with a very uncivilised part of Brazil, the population of which was entirely different to the population which gathered Eastern rubber. After the people had succeeded in getting what they required in the way of luxuries they would cease to gather in more rubber. The idea of railway developments in the country, which, if proceeded with, would have made the labour problem more difficult had now been abandoned, and he hoped that the rubber gatherers would remain in the Amazon, and that they would be encouraged to tap more rubber. Their chief troubles arose from the fact that the revenues of the State had fallen so considerably that they, in their turn, could not pay the company what they owed them. He need hardly say that the directors regarded the position very seriously. If they could collect the £35,000 from the State they would be in an excellent position. They were doing their very best to come to some arrangement whereby the ultimate payment could be secured to them, but he could give them no information about it, and it was no use his holding out any hope except to say that they were working hard to try and secure the payment of the debt.

Replying to other shareholders, the Chairman said that their contract with the State Government was such that they could not cut off the public lighting without cancelling the concession. It was an abominable arrangement, but there it was. There was also this point to be remembered—that any high-handed action of that sort might result in very great damage to their property. Therefore, after giving the matter the most careful consideration, the board had determined that they would serve the town as well as they could, and rely on the final pressure of public opinion being brought upon the Brazilian Government to ultimately secure their legitimate claim.

The report was then adopted.

British L. M. Ericsson Manufacturing Co., Ltd.—The 6 per cent. preference dividend for the half-year ending June 30th, 1914, will be paid on the 16th inst., and the transfer books are closed until 16th inst., both days inclusive.

Marconi's Wireless Telegraph Co., Ltd.—The directors announce, with regret, that owing to the present impossibility of obtaining repayment of money lent by the company on short loan against securities prior to the moratorium, they are compelled to postpone paying the dividend warrants, which otherwise would have been issued on Monday last.

Buenos Ayres Port and City Tramways, Ltd.—The directors have decided, in view of the present financial position of the company, that the coupon of the extension first mortgage debenture cannot be paid.

Metropolitan Electric Supply Co., Ltd.—The directors state that, owing to the unprecedented financial position, they have decided to defer the payment of any dividend on the ordinary shares for the present.

Crossley Brothers, Ltd.—According to the *Financial Times*, the directors report that the working results for the half-year ended June are satisfactory, but, owing to the abnormal monetary conditions, payment of the usual dividend on the preference shares, due on September 1st, is to be postponed. Warrants will be posted as soon as the directors are satisfied that the financial situation has sufficiently improved. No interim dividend will be declared on the ordinary shares.

South Metropolitan Electric Light and Power Co., Ltd.—Warrants for interim dividends, due on August 31st, on the 7 per cent. cumulative first preference shares and 6 per cent. cumulative second preference shares, for the half-year ended June 30th, 1914, have been posted as usual.

Continental.—Spain.—The amalgamation is announced of the Sociedad Electrica de Chamberi with the Co-operativa Electra.

STOCKS AND SHARES.

Tuesday Evening.

Extension of the general moratorium was practically inevitable, and the announcement from the Chancellor of the Exchequer that it would be continued until October 4th met public anticipation. That it would be on a more limited scale than its predecessor had been expected, but its full rigour remains in force for at least some time to come. Accordingly, such good people as are evading payment of their just debts, on the ground that to discharge them while a national moratorium was in progress would be an act supremely unpatriotic, will be able, if they wish, to deprive their creditors of the money for another month.

Moratorium or not, the opening of the Stock Exchange would be impossible at the present time, although there are many who think an unofficial market might be established, to be held in some City hall, or in the settling rooms of the Stock Exchange itself. It has been pointed out here that the grave danger lies in the possibility of selling being forced were an official market to be re-created, and that the Committee of the House, in deciding to keep the doors closed, are adopting the least of various evils, which all, in their way, recoil upon the community just as much as they do upon Stock Exchange members.

Dealings for cash are going on in a quiet sort of way, and it is interesting to notice that many of the principal issues amongst electric supply and power companies are saleable at present

although at prices considerably depreciated from those of a month ago. This, for instance, is a selection of some of the shares and bonds which can be sold to-day; of course, the demand is limited in each case, and it may be that at the end of the week the buyers will have got what they wanted. This being distinctly improbable, however, we set out the list as follows:—

	Bid. July 30th.	Price bid.	Fall.
Electric Lighting—			
Bournemouth and Poole 4½ per cent. Deb. ..	93	90	3
Charing Cross 4½ per cent. Deb.	100½	96	4½
Westminster Electric 4½ per cent. Pref.	5	4¾	¼
Melbourne Elec. Cons. Deb...	104	99½	4½
Tramways—			
Anglo-Argentine 4 per cent. Deb.	90	85	5
„ „ 4½ per cent. Deb.	97	92	5
Bombay Second Debs...	99	94	5
Brisbane Investment Deb.	100	92	8
Brit. Columbia Elec. Rly. 4½ per cent. Deb. ..	95	90	5
Calcutta Tramways 4½ per cent. Deb.	98	92	6
Mexico Trams First Bonds	82	75 c.d.	7
Para Elec. Railway 5 per cent. Deb.	88	84	4
Sao Paulo Trams 5 per cent. Deb...	98	92	6
Utd. Elec. Trams of Monte Video 5 per cent. Deb.	95	90	5
Miscellaneous—			
Cons. Gas. Elec. Light and Power of Baltimore 5 per cent. Deb.	99	97	2
General Electric (New York) 5 per cent. Deb...	108	103	5
Mexican Light and Pow-r 5 per cent. Bonds ..	79	73	6
Mexican Electric Light Bonds	61	55	6
Mexican Northern Power Bonds	22	18	4
Underground Elec. Income	83	80	2
„ „ 1s. shares	5s. 6d.	5s.	6d.

It must not be supposed from the figures quoted in the second column that these represent the utmost values to be obtained. By dint of negotiation—to give it a polite name—a seller could probably obtain more. It is to be understood that all the bids are for cash, and the money would be available upon delivery of the securities.

On the other side of the sheet, there are sellers of a hundred times as many stocks and shares as those set out above. The Stock Exchange policy throughout the crisis has been to maintain quotations so far as possible, in order to prevent any avoidable disturbance in the public mind. That is to say, in principle, the bargain-hunter has been discouraged, because it is felt that he might be able to buy stock from a desperate holder at a knock-out level, which, being quoted in the papers, would have an unsettling effect upon proprietors of the same and similar securities.

At the same time, if an investor wants to pick up cheap stock, he need have no hesitation in making a bid for it—which, again, must be for money; and his broker would no doubt do the best possible in order to fulfil the order. In days such as these, clients need have no scruple in asking their brokers to take up stock through the agency of their bankers, although, as a matter of fact, with the moratorium over everything, and with all bargains being done for cash, any risks in dealing with members of the Stock Exchange at the present time are reduced to a minimum.

Not a few of the companies which declared dividends, and then postponed payment of them, have by this time distributed the money. But many more are announcing their decision to pass the usual distributions at this time of the year and to carry forward the amounts, having regard to the existing state of affairs abroad. Both inconvenience and suffering are hereby entailed; and in the case of the Alabama Traction Company, for example, protests have become vocal at the Company's withholding payment of the interest on the bonds, due on September 1st. Reassuring statements to the effect that this or the other company is able to meet its obligations, but considers it prudent to suspend temporarily the discharge of them, savour of affront rather than assurance to the people who look for regular distributions in order to pay their way.

Boards of directors, of course, are in the best position to judge whether such course of action is essential; but even where it would be straining a point to make the payments, such effort would seem to be justified in most circumstances. Needless to say, we have always been the last to suggest that companies ought to strain their resources by payment of dividends, and in the past we have ventured to criticise distribution of money which not only austerity, but common prudence, demanded should have been husbanded. But with the times so out of joint as they are now, the more elasticity there can be imported into financial relations, the better for the common weal.

The cry for the capturing of German trade has already led to developments in electrical, as in other, industries. Negotiations are on foot for the acquisition of a property in England, through the formation of a company, to annex the tungsten and the tungsten acid business. Efforts are being made in the City to obtain sufficient money to erect a plant for the treatment of wolfram, with a view to winning the tungsten. Another development, of course, is that of some of the electric supply companies in the matter of providing electrically-propelled vans for the delivery of goods within a comparatively short radius, as to which particulars were given here last week, and which, we understand, has aroused a good deal of interest. Rubber companies, too, are looking out for fresh military uses to which they can put their produce, so that in various directions efforts are afoot to wrest good out of the prevailing evil.

The Buenos Ayres Port and City Tramways announces that it cannot pay the coupon on the Extension First Mortgage Debentures which became due on September 1st. This is only what had been looked for, but the suspension comes at an unlucky time, because the reorganisation scheme which was to have been put forward, but which has not yet been forthcoming, would, no doubt, include the raising of fresh capital, and, with things as they are now, the hope of getting more money for ventures of this kind must, indeed, be dim. The Marconi Company is another of those which withholds payment of its dividend.

The report of the Puebla Tramway, Light and Power Company shows a debit balance of £18,350, which is due simply to the heavy loss in exchange. The Company's various properties have not suffered materially, except for some slight damage done from time to time by bandits.

Brazil Traction shares have been weaker at 50 sellers, but, at the time of writing, there is a small buyer at that price. With regard to the dividend on the Ordinary shares of this Company, this is usually paid at the rate of 4s. 0½d. per dollar to shareholders who have not had the shares registered into their own names, but who allow them to stand in the names of big firms, in order to save the registration and stamp charges. Owing to the international situation, the rate of exchange is now quite nominal, and some of the registered holders have intimated to the proprietors that they are willing to give a dollar cheque on Toronto at $1½ per share in settlement of the amount claimed, or to withhold payment until such time as the exchange rate may again become normal.

MARKET QUOTATIONS.

Owing to the war, the prices given below are, of course, only nominal.

Wednesday, September 2nd.

CHEMICALS, &c.	Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric .. .. per cwt.	Nom.	..
a „ Nitric .. .. .. „	„	..
a „ Oxalic .. .. .. per lb.	„	..
a „ Sulphuric .. .. .. per cwt.	„	..
a Ammoniac Sal .. .. „	„	..
a Ammonia, Muriate (large crystal) per ton	„	..
a Bleaching powder .. .. .. „	„	..
a Bisulphide of Carbon .. .. „	„	..
a Borax .. .. „	„	..
a Copper Sulphate .. .. .. „	„	..
a Lead, Nitrate .. .. .. „	„	..
a „ White Sugar .. .. „	„	..
a „ Peroxide .. .. .. „	„	..
a Methylated Spirit .. .. .. per gal.	„	..
a Potassium, Bichromate, in casks per lb.	„	..
a Potash, Caustic (88/90 %) .. per ton	„	..
a „ Chlorate .. .. .. per lb.	„	..
a „ Perchlorate .. .. .. „	„	..
a Potassium, Cyanide (98/100 %) .. „ (for mining purposes only)	„	..
a Shellac .. .. per cwt.	„	..
a Sulphate of Magnesia .. .. per ton	„	..
a Sulphur, Sublimed Flowers .. „	„	..
a „ Recovered .. .. „	„	..
a „ Lump .. .. .. „	„	..
a Soda, Caustic (white 70/72 %) .. „	„	..
a „ Chlorate .. .. .. per lb.	„	..
a „ Crystals .. .. .. per ton	..	..
a Sodium Bichromate, casks .. per lb.	..	..
METALS, &c.		
b Aluminium Ingots, in ton lots .. per ton	£86	..
b „ Wire, in ton lots (1 to 14 S.W.G.) „	£107 6 8	..
b „ Sheet, in ton lots .. „	£119	..
g Babbitt's metal ingots .. .. „	£50 to £221	..
c Brass (rolled metal 2" to 12" basis) per lb.	8½d.	½d. dec.
c „ Tube (brazed) .. .. „	10d.	..
c „ „ (solid drawn) .. .. „	8¾d.	½d. dec.
c „ Wire, basis .. .. .. „	8¾d.	½d. dec.
c Copper Tubes (brazed) .. .. „	10d.	..
c „ „ (solid drawn) .. „	10d.	..
g „ Bars (best selected) .. per ton	£78	..
g „ Sheet .. .. .. „	£78	..
g „ Rod .. .. „	£78	..
d „ (Electrolytic) Bars .. „	£65	£7 dec.
d „ „ Sheets .. „	£83	£7 dec.
d „ „ Rods .. .. „	£71	£7 dec.
d „ „ H.C. Wire per lb.	8¾d.	¼d. dec.
f Ebonite Rod .. .. .. „	3/6	1/- dec.
f „ Sheet .. .. .. „	8/-	1/- dec.
n German Silver Wire .. .. „	1/7	..
h Gutta-percha, fine .. .. .. „	6/10	..
h India-rubber, Para fine .. .. „	2/10	3d. dec.
i Iron Pig (Cleveland warrants) .. per ton	£2/11	..
i „ Wire, galv. No. 8, P.O. qual. „	£16	..
g Lead, English Pig .. .. .. „	Nom.	..
m Manganin Wire No. 28 .. .. per lb.	6/6	..
g Mercury .. .. per bot.	£7	..
c Mica (in original cases) small .. per lb.	4d. to 2/6	..
c „ „ „ medium „	6/- to 5 -	..
c „ „ „ large .. „	6/8 to 10 6 & up.	..
o Nickel, sheet, wire, &c. .. .. „	Nom.	..
p Phosphor Bronze, plain castings „	1/1 to 1/3½	..
p „ „ rolled bars & rods „	1/0¾ to 1/3	..
p „ „ rolled strip & sheet „	1/3½ to 1/5½	..
o Platinum .. .. per oz.	185/-	..
d Silicium Bronze Wire .. .. per lb.	10½d.	..
r Steel, Magnet, in bars .. .. per ton	£141	..
g Tin, Block (English) .. .. „	Nom.	..
n „ Wire, Nos. 1 to 16 .. .. per lb.	2/3	..
p White Anti-friction Metals .. per ton	£44 to £194	..
k Zinc, Sh't (Vieille Montagne bnd.) „	Nom.	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

REVIEWS.

The Principles of Automatic Telephony. By Walter Atkins (Engineer, Post Office Telephones). London: *Electrician* Printing and Publishing Co., Ltd. Price 2s. net.

The continuous and rapid growth of telegraph and telephone engineering has rendered it quite impossible for anyone to keep up to date with the details of the developments in all its branches. At best, an outline knowledge only can be acquired of the work which is being done in departments other than those in which one may be particularly engaged. In the telegraph service, however, at least in this country, a man may at any time be called upon to take up any branch of the work at short notice, and it is very desirable, therefore, that he should have some idea of what is being done throughout the whole field.

The little book under review meets this need as far as automatic telephony is concerned. A sketch is given of the Strowger and Lorimer systems, sufficient to give a good fundamental knowledge of their operation and to provide a foundation for more detailed study if the reader should subsequently find such necessary. The book is well provided with diagrams and photographs, there is an entire absence of padding, and we can recommend it to all whose duties are likely to bring them into touch with automatic telephone installations.

X-Rays. By G. W. C. Kaye, D.Sc. London: Longmans, Green and Co., Ltd. Price 5s.net.

The study of X-rays, since their discovery by Röntgen in 1895, has been continuous and persistent, and although their nature cannot be said to be established beyond all doubt, yet enough is now known of them to make us fairly certain that they consist of ether waves of extremely short amplitude and great frequency, with a velocity equal to that of light. The book under review is valuable in that it gives us an account of all the most novel and original discoveries with regard to these rays; it describes present-day methods and apparatus, a complete acount of which can only be found scattered throughout many journals; it is concerned to some extent with the development of theory as well as of experiment; and it brings tne whole subject right down to the end of the year 1913.

The author—who is head of the radium department of the National Physical Laboratory—considers first the phenomena of a discharge tube and deals with the production of cathode rays—rays which can cause fluorescence, affect photographic plates, be disturbed by electric and magnetic fields, and so on. The existence of the cathode rays has been known for a long time, although their nature was entirely unsuspected until recently. Modern research has shown that they consist of particles, each about 1-1800th the mass of a hydrogen atom and each possessing a negative charge of electricity. They issue in great quantities from the cathode of the discharge tube, and striking the glass of the tube, cause the production of X-rays—rays of quite a different order, inasmuch as they can penetrate solid matter to a considerable distance.

From the scientific standpoint generally, an efficient X-ray bulb is of the first importance, and the author devotes a chapter to the consideration of this. It was soon found that the X-rays produced by allowing the cathode rays to strike the glass of the tube were unsatisfactory in that they scattered too much and therefore gave insufficient definition; accordingly, in a modern bulb the rays are produced by introducing an "anticathode," and allowing the cathode rays to impinge on this at an angle of about 45°. The anticathode is usually made of platinum because of its high melting point and high atomic weight, for experiment has shown that the metals of high atomic weight are the best "radiators." High melting point is necessary because of the intense heating effect of the cathode ray bombardment. Other metals that have been used for the anticathode are osmium, iridium, tungsten, and tantalum. The cheaper bulbs have nickel anticathodes faced with very thin platinum sheet. A photomicrograph is given of one of the last showing the fusing effects of the discharge. Various devices have been introduced for cooling the anticathode, including circulating currents of air and water, magnetic, and other means.

In order to produce a discharge current three methods may be employed: (1) influence machines, (2) induction coils, and (3) step-up transformers. The first is now obsolete, at any rate in this country; the second is generally used for ordinary work; and the third is in use where special circumstances prevail, such as where instantaneous photography is required or where for some reason a comparatively large current is necessary in the tube. The author describes the varying types of these machines, and with regard to induction coils, goes pretty fully into the question of design. Photographs of the wave-forms of the primary and secondary currents are given, and in this connection it may be of interest to note that a primary current showing superimposed high-frequency oscillations is the best for X-ray work.

An interesting chapter is on the "blackening of an X-ray bulb," that annoying phenomenon which accompanies continuous work. There are two main causes for this:—(1) The disintegration or "sputtering" of the anticathode while acting as cathode during the inverse current, and also the cathode during the direct phase; and (2) the volatilisation of the anticathode due to its high temperature under reduced pressure.

The chapter on the measurement of the rays is important and comprehensive. The British Radium standard, consisting of 21.10 milligrammes of pure radium chloride, has been certified in terms of the International standard, and is now deposited at the National Physical Laboratory. The standard serves as a means of standardising radioactive preparations as well as the energy output of X-ray bulbs. The intensity of the X-rays at a particular point is defined as the energy falling on one sq. cm. of a receiving surface passing through the point and placed at right angles to the rays, and there are several methods in practical use for determining this:—(1) By measuring the current passing through the tube; (2) by measuring the heat produced when the X-rays are completely absorbed by a metal; (3) by measuring the ionisation effects of the rays; (4) by a comparison of photographic and fluorescent effects. Of these, perhaps, the most satisfactory and exact is the ionisation method.

The author devotes some space to the practical application of the rays, and this portion of the work is illustrated by interesting photographs. Micro-radiographs are now quite commonly taken, one of the pictures in this connection showing the legs of a tiny lizard with every bone completely defined. Another remarkable photograph is a radiograph of the intestines of man, the alimentary system being rendered temporarily opaque through the administration of bismuth salts or emulsions with the food. Stereoscopic radiography is now possible, and the method is useful in ascertaining the depth of a foreign substance in the body. Instantaneous photographs can quite readily be taken, and snapshots through any part of the body and of almost any of the moving organs are common; a bullet leaving the muzzle of a revolver has been radiographed.

Chapter XII, on the interference and reflection of the rays, is a wonderful record of the wit and ingenuity of man when confronted with problems of unusual difficulty. We have space only to notice one of the examples recorded. In 1912, Prof. Laue, of

Munich, believing that X-rays were short light rays with wave-lengths of an atomic order of magnitude, conceived the notion that the regular grouping of the atoms in a crystal, which modern crystallography affirms, should be capable of producing interference effects with the X-rays, in a way analagous to that in which diffraction gratings deal with light waves. Friedrich and Knipping at once put Laue's theory to the test. They arranged that a parallel beam of X-rays should, after traversing a crystal, be received on a photographic plate, so that any directions showing "interference maxima" would be registered as spots. The first crystal that was tried gave the result anticipated from the theory.

One of the last chapters is on the nature of the rays. When they were first discovered the most diverse suggestions were made as to what they were. Röntgen himself believed them to be longitudinal ether-vibrations of short period and great wave-length. Other theories represented them to be short transverse ether-waves akin to ultra-violet light, internal vibrations of the electrons within the atom, a manifestation of the breaking up of molecules into atoms, ether vortices, irregular pulses in the ether, and flights of material particles strongly resembling the parent cathode rays. Only with the last few years has the controversy been stilled by the discovery that the rays can be reflected and diffracted by crystals, and there is now practically no doubt that they are identical with ultra-violet light of extremely short wave-lengths—wave-lengths of the order of the diameter of the atom.

Dr. Kaye's book is a good one, and is sure to be much used. It brings together in connected form all that is most interesting and important with regard to its subject; and while it contains a great quantity of matter for the serious student, it nevertheless lightens the touch here and there, as witness Mr. Robb's three verses to the Revolution of a Corpuscle, given by way of introduction. The first verse, to be sung to the air "The Interfering Parrot," from the *Geisha*, is as follows:—

A Corpuscle once did oscillate so quickly to and fro,
He always raised disturbances wherever he did go;
He struggled hard for freedom against a powerful foe—
An atom—who would not let him go.
The aether trembled at his agitations
In a manner so familiar that I only need to say,
In accordance with Clerk Maxwell's six equations
It tickled people's optics far away,
You can feel the way it's done
You may trace them as they run
$d\gamma$ by dy less $d\beta$ by dz is equal K. dx/dt,

. . . . . .

while the curl of (x, y, z) is the minus d/dt of the vector (a, b, c).

W. J. C.

Continuous and Alternating Current Machinery. By J. H. Morecroft. London: Chapman and Hall, Ltd. Price 7s. 6d. net.

"Many of the students in engineering schools do not have the time for an exhaustive study of the subject of Electrical Machinery, but every engineering graduate should have some knowledge of the different kinds of generators and motors in every-day use." The author, who is Assistant Professor of Electrical Engineering at the Columbia University, makes the above statement in his preface, and most engineers will be inclined to agree with him, in spite of the fact that a little knowledge is sometimes a dangerous thing.

The first five chapters in the book deal with the elementary principles of continuous currents and their application to continuous-current generators and motors. The treatment is quite on ordinary lines, the only essential difference between this book and many English elementary text-books being that the author uses circular mils for wire areas and the whole of his practical illustrations are for American machines.

Alternating currents and their application are next dealt with in a similar fashion. A good and concise account is given of the mercury arc and other rectifying devices. The operation and care of electrical machinery is briefly dealt with in the final chapter.

Like so many American books, the work is marred by the large number of catalogue illustrations included. There are nearly ninety altogether, and some are so poor that it is difficult to see what educative value they can possibly have.

The reviewer cannot recommend the book to English students, since it is paralleled by as good, or better, works at a cheaper price.

H. G. S.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, AUSTRALIA, 1914.—II.

Irrigation Dams and Hydro-Electric Power.

By E. Kilburn Scott, M.I.E.E., A.M.Inst.C.E.

Read in Section G (Engineering).

(*Concluded from page* 319.)

Uses for Power.—The question may be asked, what is the best use to make of electric power which is developed by water for irrigation? Seeing that irrigation dams are usually situated at considerable distances from cities and other centres where electric current is wanted for lighting, tramways, and motive power, the matter requires careful consideration.

Although electric transmission of power is efficient, a long-distance transmission line is expensive to construct and maintain, and even in countries where there is no trouble with ice and snow, there are the risks of stoppage due to wind and dust storms, bush fires, etc.

The supply of electric lighting, tramways and motive power may, for the purpose of the present argument, be called a "domestic" supply, and it is important to remember that when once such a supply is undertaken, it must be kept up at all seasons and in all years. On the other hand, the primary object of an irrigation dam is always to have a supply of water available for the farmers, and more especially so during dry seasons.

When estimating the supply available from a given source for domestic purposes, only the minimum flow can be reckoned upon, if risk of shortage is to be obviated. Therefore for a domestic supply of electricity all surplus between the minimum and the maximum flow is wasted so far as power is concerned, and expensive spill-weirs and channels have to be provided.

Clearly it is wise to make use of the electric power as near to where it is generated as possible, also for operations which use the same power right through the 24 hours, but which can be temporarily suspended if need be. The supply of light and power to a city 50 or so miles away sounds well, but it is not necessarily commercially advisable, because of the difficulty of ensuring continuous supply, because of the low load factor, and, finally, because the supply must be at a standard pressure and periodicity, which, as we have seen, are difficult to get where the head of water varies.

The first use which suggests itself is the utilisation of the power for pumping purposes. By this means the irrigation area can be extended beyond that which can be reached by gravitation channels. In some cases in the United States, electric energy is used to pump water out of the same river which develops the power. Hydroelectric pumping is being largely utilised in connection with Chilean irrigation work.

When the Assuan dam comes to be harnessed a part of the power is to be transmitted about 30 miles and used for pumping. It may be mentioned that Assuan presents considerable difficulties because, in the first place, it is not easy to select an industry to be pursued which could utilise power that varies between 100,000 H.P. and 10,000 H.P.; also during the greater part of the year the climate at Assuan is extremely hot, and it is therefore difficult to develop large manufacturing industries in such a climate.

When the Trawool dam scheme was being considered a suitable use for the power appeared to be to transmit it to the cities of Ballarat, Bendigo and Melbourne for a domestic supply. The great advances in the last few years of electrochemistry and metallurgy have, however, changed the situation considerably.

During this brief period of eight years, many new industries which utilise large quantities of cheap electrical energy have safely passed the experimental stage, and a single factory making fertilisers could now easily utilise the entire output of the water power, and with an absolute certainty of selling the product without disturbing prices.

The tendency is now to establish electrochemical and metallurgical factories close to the power and so dispense with transmission lines; also to work the water power and the factory together, arranging the output of the one to meet the demand of the other so that the utmost use can be made of the water available. When that is done surplus water need not be wasted, and under certain conditions the whole mean annual rainfall may be reckoned upon after allowing for evaporation.

The following are some of the new electrical industries which require large quantities of electrical power at low cost:—

1. Manufacture of nitric acid from atmospheric nitrogen in electric furnaces by the direct method.
2. Making nitrogenous and phosphate nitrogenous fertilisers by the direct process.
3. Manufacture of calcium carbide for acetylene lighting.
4. Manufacture of calcium cyanamide fertiliser from calcium carbide.
5. Electric reduction of iron and steel.
6. Making alkali from salt by electrolysis.
7. Making aluminium from bauxite.
8. Making carborundum for use as an abrasive.
9. Making graphite in the electric furnace.
10. Melting concentrates.
11. Treating refractory zinc ores, etc.

Some of these industries have to be carried on continuously, as, for example, the manufacture of calcium carbide and calcium cyanamide, the reduction of iron and steel, and the making of aluminium, etc. The cost of stoppage and restarting is excessive in all smelting and allied operations. On the other hand some of the industries, such as fixation of atmospheric nitrogen by the direct process, can be worked intermittently. The manufacture of graphite can also be carried on intermittently.

Fixation of Nitrogen.—Where the water can only be used for a portion of the year, the problem is to fix upon some particular industry which can utilise power intermittently, and will permit of changes in the amount of labour employed, without undue additional expense. Also, the product must be such that it has a very widespread market, so that when it is turned out in considerable quantities it does not upset prices. At the same time it should be capable of being conveniently stored at times when the output may temporarily exceed the demand.

The manufacture of fertilisers from atmospheric nitrogen by the direct furnace process meets all these conditions, and is therefore ideal. Not only can the process be carried out intermittently, but the demand is practically unlimited, for to be continuously productive all soil requires plant foods.

Virgin soils have such foods accumulated in them and for the first few years they give good crops, but sooner or later there comes a time when fertilisers must be added. If wheat and other similar crops are grown year after year from the same ground the natural plant foods accumulated therein become exhausted. Of these nitrogen takes first rank.

The best policy is to utilise the power of irrigation water for the manufacture of such commodities as will be of direct use to the farmers. Fertilisers are undoubtedly the right commodities to make, and it is very fortunate that the manufacture of some of these fertilisers can be carried on intermittently.

At the Portsmouth meeting of the British Association I read a paper in which were described the various methods and the furnaces in use for fixing atmospheric nitrogen. It will therefore be sufficient to state here that the most *direct* and simple method to make fertiliser is to blow air through an electric arc flame so as to form nitric oxide gas. In the presence of oxygen this changes to nitrogen peroxide, which, when brought into contact with water, produces nitric acid.

If lime is acted on by this dilute nitric acid a nitrogenous fertiliser called calcium nitrate, containing 12¾ per cent. of nitrogen, is produced. Large quantities of this fertiliser are made in Norway, and it is finding its way to the fruit lands of California and to other parts of the Pacific in competition with sodium nitrate and sulphate of ammonia.

Phosphate Nitrogenous Fertiliser.—A valuable fertiliser can be made by grinding up phosphate rock and mixing it with water to the consistency of cream. When the gas from the furnace is passed through this it changes the phosphate into the citric soluble state, so making it valuable as phosphate fertiliser. At the same time the lime is acted upon and takes up nitrogen, so that the fertiliser contains two out of the three principal plant foods.

For some time I have been interested in a scheme to utilise waste basic slags from steel furnaces, which at present cannot be used by agriculturists. The phosphate of basic Bessemer slag is in the soluble condition and is very largely used as a phosphorus fertiliser, but the slag from some open-hearth steel furnaces is largely insoluble, and so the phosphorus is not in a form in which it is immediately available for agriculture.

This waste basic slag is being produced in Middlesbrough alone at the rate of 150,000 tons a year. With the aid of the electric furnace it may be possible in the future to turn it to good account.

It may be mentioned that the direct method of making fertilisers has reached enormous proportions in Norway. One factory utilises 140,000 H.P., which is generated by a water power at Rjukan, whilst another factory to utilise 120,000 H.P. is also being equipped. About eight millions sterling is invested in the business in Norway alone, this money having been principally found by Scandinavian and French investors.

Calcium Cyanamide.—During the last year a good deal has been heard of the *indirect* method of fixing atmospheric nitrogen.

This method commences with the manufacturing of calcium carbide for which limestone and coke or anthracite are treated in the electric furnace. After the carbide has cooled down it is ground to a fine powder in closed chambers in an atmosphere of nitrogen so as to prevent formation of acetylene gas.

The powdered carbide is then changed into calcium cyanamide by being electrically heated, whilst pure nitrogen is forced through it. For this purpose the powdered carbide is run into a large number of barrel-like retorts, crinkled paper being put in with it so as to provide passages for nitrogen gas. The retorts are comparatively small and each has a rod of carbon down the centre for the electric current to pass through to start the reaction.

It is of the utmost importance that the nitrogen be absolutely pure, and it is usually made by the liquid air process. A meter on each retort registers the amount of nitrogen which passes in, and when all that is possible has been absorbed the retorts are given time to cool down. The contents are tipped out and ground up ready for market.

It will be noted that this indirect method requires a great deal of plant and makes use of electric power for several operations. If, as in the case of Assuan, manufacture can only be carried on for eight months of the year it means that a great deal of very expensive plant is going to stand idle for a third of the year.

The writer is, therefore, of opinion that the *direct* method is the best to adopt for such water powers as are being considered in this paper, because it is so very simple and the raw materials are only air and water. Also, the process can be carried on to suit the exigencies of the power supply, and the voltage periodicity may be varied. The plant required is a minimum and it needs very little attention.

Thus far all the furnaces which have been used in Norway and elsewhere have worked with single-phase alternating current, and as the power is usually generated as three-phase the furnaces have to be used in sets of three.

Three-Phase Furnace.—I have been at work on this problem for the last few years and have made an efficient three-phase furnace. I claim that for a given power the first cost is much less than it would be for three separate single-phase furnaces; also, the space occupied is less and attendance and maintenance costs are lowered. By combining the three arc flames together a balanced load is given on all the phases, also continuity of working is assured because current is always flowing in one or other of the phases and the arcs thus maintain each other.

The combined flame takes the form of an inverted cone, and thus a large portion of the air passing through the furnace is enabled to come into intimate contact with the flame. Further, a combined flame is naturally hotter than if the same energy were expended in three separate furnaces because the latter have greater radiation losses, etc. High temperature is all-important. Professor Nernst has shown that the yield of nitric oxide depends partly on the temperature, and it goes up very rapidly indeed at the highest temperatures.

By projecting a stream of high-voltage high-frequency sparks into the space between the electrodes where they are nearest together the air dielectric is broken down without any adjustment of the main electrodes, and it is thus possible to control a powerful furnace by means of quite a small switch. Also, the quantity of air is in no way restricted by the position of the electrodes.

A boiler forms an integral part of the furnace, and this not only effectively cools the gases, but at the same time heat that would otherwise be wasted is utilised for raising steam. None of the furnaces in use abroad has a boiler applied directly. The steam raised in the boiler may be used to generate electric energy, which if passed back into the furnace enables the combination to work regeneratively.

Where there is plenty of water power, as in Norway, there may not be much advantage in regenerative working, but where the power is limited, as it would naturally be at an irrigation dam, then there is something to be said for it. The advantage, however, is most apparent where the electricity is obtained from power plants using steam turbines.

The Migration Towards Power.—The evolution of power from primitive water wheels to steam engines, then to steam turbines, and again back to water, has had a considerable effect on the geographical distribution of manufacturing. The factories of the olden times were placed on the banks of the rivers because the prime movers were water wheels, and the power was directly transmitted from the water wheel through shafting to the machine. Later came the utilisation of the potential energy in coal by means of steam engines, and factories began to centre on the coal-fields of the world. This phase is still going on, but along with it there is a distinct trend of new industries towards districts and countries where hydro-electric power is available.

In new countries manufacturing centres are apt to be located somewhat haphazard, and by such accidents as the location of the first factory of a given industry; but as economic law and consuming necessities begin to operate there is always a movement towards productive soil and a consuming population.

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Munich, believing that X-rays were short light rays with wave-lengths of an atomic order of magnitude, conceived the notion that the regular grouping of the atoms in a crystal, which modern crystallography affirms, should be capable of producing interference effects with the X-rays, in a way analagous to that in which diffraction gratings deal with light waves. Friedrich and Knipping at once put Laue's theory to the test. They arranged that a parallel beam of X-rays should, after traversing a crystal, be received on a photographic plate, so that any directions showing "interference maxima" would be registered as spots. The first crystal that was tried gave the result anticipated from the theory.

One of the last chapters is on the nature of the rays. When they were first discovered the most diverse suggestions were made as to what they were. Röntgen himself believed them to be longitudinal ether-vibrations of short period and great wave-length. Other theories represented them to be short transverse ether-waves akin to ultra-violet light, internal vibrations of the electrons within the atom, a manifestation of the breaking up of molecules into atoms, ether vortices, irregular pulses in the ether, and flights of material particles strongly resembling the parent cathode rays. Only with the last few years has the controversy been stilled by the discovery that the rays can be reflected and diffracted by crystals, and there is now practically no doubt that they are identical with ultra-violet light of extremely short wave-lengths—wave-lengths of the order of the diameter of the atom.

Dr. Kaye's book is a good one, and is sure to be much used. It brings together in connected form all that is most interesting and important with regard to its subject; and while it contains a great quantity of matter for the serious student, it nevertheless lightens the touch here and there, as witness Mr. Robb's three verses to the Revolution of a Corpuscle, given by way of introduction. The first verse, to be sung to the air "The Interfering Parrot," from the *Geisha*, is as follows:—

A Corpuscle once did oscillate so quickly to and fro,
He always raised disturbances wherever he did go;
He struggled hard for freedom against a powerful foe—
An atom—who would not let him go.
The aether trembled at his agitations
In a manner so familiar that I only need to say,
In accordance with Clerk Maxwell's six equations
It tickled people's optics far away,
You can feel the way it's done
You may trace them as they run
$d\gamma$ by dy less $d\beta$ by dz is equal K. dx/dt,
. . . . . .
. . . . . .

while the curl of (x, ɣ, z) is the minus d/dt of the vector (a, b, c).

W. J. C.

Continuous and Alternating Current Machinery. By J. H. Morecroft. London: Chapman and Hall, Ltd. Price 7s. 6d. net.

"Many of the students in engineering schools do not have the time for an exhaustive study of the subject of Electrical Machinery, but every engineering graduate should have some knowledge of the different kinds of generators and motors in every-day use." The author, who is Assistant Professor of Electrical Engineering at the Columbia University, makes the above statement in his preface, and most engineers will be inclined to agree with him, in spite of the fact that a little knowledge is sometimes a dangerous thing.

The first five chapters in the book deal with the elementary principles of continuous currents and their application to continuous-current generators and motors. The treatment is quite on ordinary lines, the only essential difference between this book and many English elementary text-books being that the author uses circular mils for wire areas and the whole of his practical illustrations are for American machines.

Alternating currents and their application are next dealt with in a similar fashion. A good and concise account is given of the mercury arc and other rectifying devices. The operation and care of electrical machinery is briefly dealt with in the final chapter.

Like so many American books, the work is marred by the large number of catalogue illustrations included. There are nearly ninety altogether, and some are so poor that it is difficult to see what educative value they can possibly have.

The reviewer cannot recommend the book to English students, since it is paralleled by as good, or better, works at a cheaper price.

H. G. S.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, AUSTRALIA, 1914.—II.

Irrigation Dams and Hydro-Electric Power.

By E. Kilburn Scott, M.I.E.E., A.M.Inst.C.E.

Read in Section G (Engineering).

(*Concluded from page* 319.)

Uses for Power.—The question may be asked, what is the best use to make of electric power which is developed by water for irrigation? Seeing that irrigation dams are usually situated at considerable distances from cities and other centres where electric current is wanted for lighting, tramways, and motive power, the matter requires careful consideration.

Although electric transmission of power is efficient, a long-distance transmission line is expensive to construct and maintain, and even in countries where there is no trouble with ice and snow, there are the risks of stoppage due to wind and dust storms, bush fires, etc.

The supply of electric lighting, tramways and motive power may, for the purpose of the present argument, be called a "domestic" supply, and it is important to remember that when once such a supply is undertaken, it must be kept up at all seasons and in all years. On the other hand, the primary object of an irrigation dam is always to have a supply of water available for the farmers, and more especially so during dry seasons.

When estimating the supply available from a given source for domestic purposes, only the minimum flow can be reckoned upon, if risk of shortage is to be obviated. Therefore for a domestic supply of electricity all surplus between the minimum and the maximum flow is wasted so far as power is concerned, and expensive spill-weirs and channels have to be provided.

Clearly it is wise to make use of the electric power as near to where it is generated as possible, also for operations which use the same power right through the 24 hours, but which can be temporarily suspended if need be. The supply of light and power to a city 50 or so miles away sounds well, but it is not necessarily commercially advisable, because of the difficulty of ensuring continuous supply, because of the low load factor, and, finally, because the supply must be at a standard pressure and periodicity, which, as we have seen, are difficult to get where the head of water varies.

The first use which suggests itself is the utilisation of the power for pumping purposes. By this means the irrigation area can be extended beyond that which can be reached by gravitation channels. In some cases in the United States, electric energy is used to pump water out of the same river which develops the power. Hydroelectric pumping is being largely utilised in connection with Chilean irrigation work.

When the Assuan dam comes to be harnessed a part of the power is to be transmitted about 30 miles and used for pumping. It may be mentioned that Assuan presents considerable difficulties because, in the first place, it is not easy to select an industry to be pursued which could utilise power that varies between 100,000 H.P. and 10,000 H.P.; also during the greater part of the year the climate at Assuan is extremely hot, and it is therefore difficult to develop large manufacturing industries in such a climate.

When the Trawool dam scheme was being considered a suitable use for the power appeared to be to transmit it to the cities of Ballarat, Bendigo and Melbourne for a domestic supply. The great advances in the last few years of electro-chemistry and metallurgy have, however, changed the situation considerably.

During this brief period of eight years, many new industries which utilise large quantities of cheap electrical energy have safely passed the experimental stage, and a single factory making fertilisers could now easily utilise the entire output of the water power, and with an absolute certainty of selling the product without disturbing prices.

The tendency is now to establish electrochemical and metallurgical factories close to the power and so dispense with transmission lines; also to work the water power and the factory together, arranging the output of the one to meet the demand of the other so that the utmost use can be made of the water available. When that is done surplus water need not be wasted, and under certain conditions the whole mean annual rainfall may be reckoned upon after allowing for evaporation.

The following are some of the new electrical industries which require large quantities of electrical power at low cost:—

1. Manufacture of nitric acid from atmospheric nitrogen in electric furnaces by the direct method.
2. Making nitrogenous and phosphate nitrogenous fertilisers by the direct process.
3. Manufacture of calcium carbide for acetylene lighting.
4. Manufacture of calcium cyanamide fertiliser from calcium carbide.
5. Electric reduction of iron and steel.
6. Making alkali from salt by electrolysis.
7. Making aluminium from bauxite.
8. Making carborundum for use as an abrasive.
9. Making graphite in the electric furnace.
10. Melting concentrates.
11. Treating refractory zinc ores, etc.

Some of these industries have to be carried on continuously, as, for example, the manufacture of calcium carbide and calcium cyanamide, the reduction of iron and steel, and the making of aluminium, etc. The cost of stoppage and restarting is excessive in all smelting and allied operations. On the other hand some of the industries, such as fixation of atmospheric nitrogen by the direct process, can be worked intermittently. The manufacture of graphite can also be carried on intermittently.

Fixation of Nitrogen.—Where the water can only be used for a portion of the year, the problem is to fix upon some particular industry which can utilise power intermittently, and will permit of changes in the amount of labour employed, without undue additional expense. Also, the product must be such that it has a very widespread market, so that when it is turned out in considerable quantities it does not upset prices. At the same time it should be capable of being conveniently stored at times when the output may temporarily exceed the demand.

The manufacture of fertilisers from atmospheric nitrogen by the direct furnace process meets all these conditions, and is therefore ideal. Not only can the process be carried out intermittently, but the demand is practically unlimited, for to be continuously productive all soil requires plant foods.

Virgin soils have such foods accumulated in them and for the first few years they give good crops, but sooner or later there comes a time when fertilisers must be added. If wheat and other similar crops are grown year after year from the same ground the natural plant foods accumulated therein become exhausted. Of these nitrogen takes first rank.

The best policy is to utilise the power of irrigation water for the manufacture of such commodities as will be of direct use to the farmers. Fertilisers are undoubtedly the right commodities to make, and it is very fortunate that the manufacture of some of these fertilisers can be carried on intermittently.

At the Portsmouth meeting of the British Association I read a paper in which were described the various methods and the furnaces in use for fixing atmospheric nitrogen. It will therefore be sufficient to state here that the most *direct* and simple method to make fertiliser is to blow air through an electric arc flame so as to form nitric oxide gas. In the presence of oxygen this changes to nitrogen peroxide, which, when brought into contact with water, produces nitric acid.

If lime is acted on by this dilute nitric acid a nitrogenous fertiliser called calcium nitrate, containing 12¾ per cent. of nitrogen, is produced. Large quantities of this fertiliser are made in Norway, and it is finding its way to the fruit lands of California and to other parts of the Pacific in competition with sodium nitrate and sulphate of ammonia.

Phosphate Nitrogenous Fertiliser.—A valuable fertiliser can be made by grinding up phosphate rock and mixing it with water to the consistency of cream. When the gas from the furnace is passed through this it changes the phosphate into the citric soluble state, so making it valuable as phosphate fertiliser. At the same time the lime is acted upon and takes up nitrogen, so that the fertiliser contains two out of the three principal plant foods.

For some time I have been interested in a scheme to utilise waste basic slags from steel furnaces, which at present cannot be used by agriculturists. The phosphate of basic Bessemer slag is in the soluble condition and is very largely used as a phosphorus fertiliser, but the slag from some open-hearth steel furnaces is largely insoluble, and so the phosphorus is not in a form in which it is immediately available for agriculture.

This waste basic slag is being produced in Middlesbrough alone at the rate of 150,000 tons a year. With the aid of the electric furnace it may be possible in the future to turn it to good account.

It may be mentioned that the direct method of making fertilisers has reached enormous proportions in Norway. One factory utilises 140,000 H.P., which is generated by a water power at Rjukan, whilst another factory to utilise 120,000 H.P. is also being equipped. About eight millions sterling is invested in the business in Norway alone, this money having been principally found by Scandinavian and French investors.

Calcium Cyanamide.—During the last year a good deal has been heard of the *indirect* method of fixing atmospheric nitrogen.

This method commences with the manufacturing of calcium carbide for which limestone and coke or anthracite are treated in the electric furnace. After the carbide has cooled down it is ground to a fine powder in closed chambers in an atmosphere of nitrogen so as to prevent formation of acetylene gas.

The powdered carbide is then changed into calcium cyanamide by being electrically heated, whilst pure nitrogen is forced through it. For this purpose the powdered carbide is run into a large number of barrel-like retorts, crinkled paper being put in with it so as to provide passages for nitrogen gas. The retorts are comparatively small and each has a rod of carbon down the centre for the electric current to pass through to start the reaction.

It is of the utmost importance that the nitrogen be absolutely pure, and it is usually made by the liquid air process. A meter on each retort registers the amount of nitrogen which passes in, and when all that is possible has been absorbed the retorts are given time to cool down. The contents are tipped out and ground up ready for market.

It will be noted that this indirect method requires a great deal of plant and makes use of electric power for several operations. If, as in the case of Assuan, manufacture can only be carried on for eight months of the year it means that a great deal of very expensive plant is going to stand idle for a third of the year.

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by means of irrigation dams is kept for service in their neighbourhood for the manufacture of commodities which they themselves specially require. As Australia becomes more and more a wheat-growing country, more nitrogenous fertiliser will be required, and it should be obtained from the air by electric power.

The question of making ammonium nitrate (from the dilute acid) for making safety explosives and also concentrating the nitric acid to make high explosives is also of interest. Independently of the importance of each country making its own explosive materials for defence and mining purposes, there is going to be a large outlet for explosives to break up soil instead of ploughing it; also for making holes for planting fruit trees, etc. The latter method is very much superior to digging the holes, as the soil is loosened all round and it is much cheaper and quicker.

The Limiting Conditions for the Safe Use of Electricity in Coal Mining.

By Prof. W. M. Thornton, D Sc., D.Eng.

(*Section G. Abstract.*)

The paper is a summary of recent researches on the limits of electrical ignition of inflammable mine-gases and coal-dust. The lower limit of inflammability is 5.6 per cent. of methane in air by volume; a temperature of 200° C. lowers this to 5.1 per cent. The most inflammable mixtures are at 8 per cent. for continuous-current break-sparks, 10.2 per cent. for alternating-current breaks. Excess of nitrogen appears markedly to increase the necessary igniting current. With non-inductive circuits 1 ampere at 100 continuous volts is a typical value; the corresponding values with alternating current are 7 amperes at 40 periods a second, 16 at 20, 20 at 80, and 29 at 100. By varying the inductance the energy of an igniting break-spark is found to be constant at about 0.1 joule. Electric signalling bells have inductance up to 0.5 henry and ignite gases at the trembler spark or signalling point. All electric lamps and fuses, however small, must be enclosed. Oscillations on a cable sheath caused by short circuits on the conductor will not ignite gas, but maintained leakage arcs from armouring are only slightly more active than break-sparks. Static discharges from 6-inch high-speed belting could not be made to ignite gas, nor the blue brush discharge from high-pressure conductors. Movements of clouds of dust have been shown to give electrification and to cause sparks, but the energy must be much greater than can be obtained experimentally in order that this should become dangerous. Wireless telegraph operations on the surface do not induce sparking potentials underground. Capacity sparks in general from cables left insulated after being charged are very active, 0.002 to 0.005 joule causing ignition. The influence of gas in forwarding coal-dust explosions begins to be felt when ½ per cent. of gas is present. At 2 per cent. full ignitions are obtained at every trial. Coal-dust alone can be ignited by both continuous-current and alternating-current break-flashes, the former requiring 3.5 to 6 amperes at 480 volts in non-inductive circuits, the latter 14 amperes at 40 periods and on a power factor of 0.8. Continuous-current faults on the negative cable develop rapidly in the presence of moisture and the cable is disintegrated. Alternating-current faults are self-healing, and a mechanical fault does not increase electrically on an alternating-current cable.

Armouring is necessary under modern power conditions; lighting and signalling circuits must be equally well protected to prevent open sparking. The limits of safety are electrically low, but the risks of ignition are even now no greater than those attending the use of flame safety lamps, and they can be entirely prevented.

BRITISH TRADE IN AUSTRALIA.

The following are extracts from a report on the trade of Australia by H.M. Trade Commissioner which has been published by the Board of Trade; the report itself may be obtained from Messrs. Wyman & Sons, Ltd., Fetter Lane, E.C., the price being 2½d.

The following table shows the total imports into the Commonwealth for the six years ending 31st December, 1913, with the shares of the United Kingdom, Germany and the United States:—

Year.	Total Imports. Thousand £.	Percentage of Total Imports from U.K.	Germany.	U.S.A.
1908	49,799	50.75	9.00	13.22
1909	51,172	50.54	8.87	11.60
1910	60,014	50.68	8.69	12.76
1911	66,968	48.88	9.52	13.45
1912	78,158	50.06	9.15	13.77
*1913	77,248	50.27	9.09	14.12

* Subject to revision.

That preference is of material benefit to British trade there can be no doubt whatever, and importers are emphatic in stating that this is so. The extent to which it is of benefit, however, is a matter which it is somewhat difficult to determine.

With regard to metals and machinery, notwithstanding the preference, our foreign competitors have materially increased their relative and actual positions. In the metals, etc., group, lower prices, due to highly organised methods of production and distribution, more rapid filling of orders, as well as lower rates of land and sea freight, sometimes enable foreign manufacturers to neutralize the benefits derivable by the Mother Country from preference. Of the total value of the trade in 1912 in the metals section, about 55 per cent. was affected by preference. While the British proportion marked a decline of over 2 per cent. between 1908 and 1912, that of foreign countries showed a corresponding advance. Notwithstanding the presumptive adverse effect of preference on foreign trade, the increase in value of the latter in the metal group amounted to over 97 per cent. in the five years, as against an increase of about 76 per cent. in the trade of the United Kingdom under preferential conditions.

In the section of metals, etc., not affected by preference little change is apparent in the relative positions of the United Kingdom and foreign countries in 1908 and 1912. The increase in value of the trade from the United Kingdom in the five years amounted to about 52 per cent., and that from foreign countries to about 54 per cent.

Machinery.—Competition in machinery is chiefly with the United States, which has nearly one-third of the trade. In electrical machinery (dynamos and starting and regulating apparatus) the effects of both American and German competition are felt—chiefly the former. The British percentage shows a decline in the three years reviewed, but it is most marked in the trade in dynamos over 200 H.P. (17½ per cent.-12½ per cent.) and in starting and regulating machinery (20 per cent.). The imports under these two sub-divisions combined are far less in value, however, than the imports of dynamos of lower horse power (25 per cent.-20 per cent.), in which the United Kingdom has about half of the trade. The imports of locomotives (25 per cent.-20 per cent.) fluctuate considerably, but amounted to over £468,000 in 1912, the average share of the United Kingdom for the three years 1910-12 being over 77 per cent. The United States is practically our only competitor. American firms have sometimes secured orders by guaranteeing quick delivery. Local engineering shops turn out considerable numbers of locomotives, one finely equipped establishment in Queensland having a capacity of one engine per week. It is always fully occupied with orders from different parts of the Commonwealth; but establishments such as that referred to are often not in a position to guarantee rapid delivery, while their prices are higher than those for imported locomotives, notwithstanding the handicap of Customs duty on the latter. In mining machinery the British position is weakest in that for coalcutting (5 per cent.—free), in which the United States has about 90 per cent., but the trade is unimportant, having averaged only about £15,000 during the three years reviewed. In rotary percussive drills (5 per cent.—free) the United Kingdom has about one-fifth of the trade only, notwithstanding the preference, the remainder being with the United States. The total trade is comparatively small, however, averaging under £33,000 per annum. In other mining machinery, viz., that for earth and rock cutting, dredging, etc. (25 per cent.-20 per cent.) the position of the United Kingdom is stronger, having averaged over 60 per cent. in the three years under review, out of an annual average total of about £51,000. Both Germany and the United States participate in this trade.

In machine tools (free) there is considerable competition from the United States and to a less extent from Germany, the average share of the United Kingdom being about 51 per cent. of an annual average of about £120,000.

In machinery not particularly specified, on which a duty of 25 per cent. under the general tariff and 20 per cent. under United Kingdom preferential tariff is charged, the average annual value of the imports was about £850,000, and of this the United Kingdom had nearly two-thirds, the most serious competition being that from the United States, which improved its percentage by over 2 per cent. in three years, while the United Kingdom's share remained stationary. In the much less important trade in machinery not particularly described, on which a general tariff duty of 15 per cent. is charged, with no preference, the British position improved by 5½ per cent., while imports from the United States showed only a slight advance, and imports from Germany declined.

Metal manufactures.—This forms one of the most important groups of imports, and naturally embraces a very wide range of items. From the point of view of foreign competition the item in which the position of British trade is most unsatisfactory, not only in this group but throughout the whole range of imports, is iron and steel wire (free), being chiefly that used for fencing. In the three years reviewed in the table to which reference has been made, the total value of this trade increased from about £700,000 in 1910 to about £724,000 in 1912. The following figures show the value of the shares of the three principal countries interested:—

	Imports from U.K. Thousand £.	Germany. Thousand £.	U.S.A. Thousand £.
1910	115	381	180
1911	111	320	266
1912	113	298	304

Canada and Belgium both participate to a small extent in this trade, but their shares have declined since 1910. Apart from the unsatisfactory position of the United Kingdom, the most remarkable feature of the foregoing figures is the great decline in German trade and the corresponding increase in that of the United States. The German position is stated to have improved in 1913, but detailed figures on this point are not yet available. The demand for galvanised wire appears to be greater than for black wire. The success of the German manufacturer in this important staple has been explained as being due to:—

1. Syndicated methods of production and distribution, under which the German wire Verband pays an export bounty;
2. Lower freight rates;
3. Cheaper manufacturing processes;
4. The readiness to meet the demand for lower quality of wire in some instances.

As regards American wire, lower freights are also a factor, while there seems to be little doubt that this wire is sold in the Australian market at a lower rate than in the home market. All these factors combined make for lower prices, with which our manufacturers apparently are unable to compete.

Tools of trade (free).—The value of the tools imported increased from about £533,000 in 1910 to £695,000 in 1912, on an average the British share being just about half. The most serious competition met with is with the United States, the imports from that country having increased in the period mentioned from £215,000 to £305,000. The competition from Germany in this line is not serious, her average trade having been under £35,000 per year. There is slight competition from Canada, Sweden and France. The success of American manufacturers of tools is explained by importers as being due to various factors. The American tool makers are stated to be readier to take up a novelty than the British; they put up their tools for the shelf in a more attractive way, and also in such a manner as gives a minimum of trouble to the man behind the counter. They not only advertise them more extensively themselves, but provide the retailer with abundant advertising matter, show cards, etc., for use in the shop. Moreover, they spare no pains to demonstrate the utility of their goods by entrusting the business of making a market to men thoroughly conversant with the article offered. Importers claim that the British manufacturer is in some of these respects behind the times, and while admitting that he maintains his position in some lines of the tool trade, it is urged that his share of the trade would be larger if more attention were paid to detailed study of the Australian market. Tool-making firms in the United Kingdom are probably familiar with criticism of this kind, and in some instances they have adapted themselves to meet the conditions of the Australian market, but, if the importer may be believed, there is still room for closer study of local conditions on the part of our home manufacturers. In this as in other branches of trade the importance of studying both the manufacturing and distributing methods of our competitors is apparent. The problem for the manufacturer is not so much the sale of goods he already makes as what is the exact article required in a given market.

Electrical and gas appliances, not elsewhere included (17½ per cent.-10 per cent.).—Notwithstanding the substantial tariff preference to goods from the United Kingdom its share in this trade has only averaged a little under 52 per cent. of the total, which increased from about £153,000 in 1910 to over £245,000 in 1912. The trade of the United States in goods of this class shows a more rapid increase than that of Germany, although the latter is still slightly ahead of the former. This appears to be an instance where factors are operative which tend to minimise the effect of preference.

In telephone switchboards and appliances (free) the British share has declined from nearly 44 per cent. to about 35½ per cent. in three years, in relation to an increase in the trade from £105,000 to £164,000. The greater part of the imports are from Sweden, but it is noteworthy that in the three years under review the United States increased her sales of goods of this class from £3,000 to £30,000.

Rails, fishplates, etc. (15 per cent.-10 per cent.).—This trade has increased from about £820,000 in 1910 to £1,300,000 in 1912, the share of the United Kingdom being about 48½ per cent in the former year and close on 65 per cent. in the latter. A consideration of the detailed figures suggests that factors of greater moment than tariff preference have been operative in determining the position. Up to the present steel rails have not been manufactured to any great extent in the Commonwealth, but when the steel works at Newcastle, New South Wales, now under construction by the Broken Hill Co., are in operation, the local output should be considerably augmented, and may eventually meet the demand for the whole of Australia. It is anticipated that the rolling mills at Newcastle will be turning out rails in the course of next year.

Trade Inquiries.

The Trade Commissioner will be glad to furnish information regarding the nature and extent of foreign competition in respect of any of the items. It will assist him in replying to inquiries if these are made in the form of a series of specific questions, instead of in a general way.

Catalogues.—Although there is on file in the Trade Commissioner's office a large number of catalogues of British manufacturers of various kinds, it is felt that the collection is by no means as representative as it might be. British firms who have not already done so are invited by the Trade Commissioner to forward issues of their catalogues. These should show the full export discounts, and should state whether packing is included in the price or discount, whether quotations are f.o.b. at a British port, and whether the firm is prepared to quote c.i.f. at an Australian port. They would also do well to furnish the names and addresses of their agents, if any, in the Commonwealth in order that these may be incorporated in the existing lists of agencies before mentioned, if such be necessary.

It is hoped that the principals or travelling representatives of British firms visiting Melbourne or Sydney will make use of the Trade Commissioner's Office to a greater extent than hitherto. The Commissioner trusts that business men will regard his offices as a bureau where information likely to be useful to them is available in convenient form.

ELECTRIC FURNACES AND ELECTRIC STEEL PRODUCTION.*

In the first electric furnace of practical value (Stassano, 1898) heat was conveyed to the charge simply by radiation from an electric arc. Furnaces of this type are now usually confined to melting weights up to 2 tons of metal for casting. Almost simultaneously with the Stassano furnace the Héroult furnace was invented, and this type is now the most extensively employed. It is equally applicable to melting cold scrap and to refining molten metal, and a number of Héroult furnaces accommodating 25 tons' charge are in regular service. The Girod furnace (1906) is applicable to the same class of work as the Héroult furnace, but has so far not been built for more than 15 tons' charge. The Keller furnace is similar to the Girod type, but has found limited application, and that chiefly in France. The Nathusius furnace, invented in 1908 and since built in sizes up to 10 or 20 tons, is applicable to the same duties as the Girod furnace and is specially suitable for melting ferro-manganese. The Nathusius furnace is characterised by current flow between the electrodes in the floor of the furnace; the total heating can be distributed at will between the upper and lower electrodes. Many as are the patents which have been granted, no other really distinctive types of arc furnace have yet been evolved.

Late in the nineties the Kjellin and Frick induction furnaces were introduced. These types differ only in the form and arrangement of the primary coils. The Kjellin furnace can be used instead of crucible furnaces, but is not, says Dr. Guggenheim in *E.T.Z.*, very suitable for refining processes, and is subject to metallurgical and electrical defects. The latest Frick furnaces are free from these defects, and satisfactorily applicable to refining processes. Two Frick furnaces of 20 tons' capacity are used in America to make high-grade steel from molten charge; more extensive use of this type is to be anticipated. The Röchling-Rodenhauser induction furnace was the first to find extensive application; it is now used chiefly to refine molten metal and to melt ferro-manganese. The largest furnace of this type yet built has 12 tons' capacity.

The statistics presented in Table I (wherein doubtful figures are marked ?) show that arc furnaces find most favour, the greater number used, as compared with induction furnaces, increasing year by year. The 1913-14 data relating to Héroult, Girod, Nathusius, Kjellin, Röchling-Rodenhauser and Frick furnaces are derived from firms licensed to build these types. The number of Stassano, Keller, Chaplet and other arc furnaces has increased but slowly or has decreased, and, among the induction furnaces, only the Röchling-Rodenhauser and Frick types have made important advance since 1908.

TABLE I.—Electric Steel Furnaces, 1908—1913-14.

Type.	In Use.			Under construction.		
	1908.	1910.	1913-14.	1908.	1910.	1913-14.
Arc:—						
Héroult	12	22	47	7	17	20
Girod	2	9	21	8	8	6
Nathusius	—	2	5	—	—	4
Stassano	8	5	10 ?	3	1	?
Keller	1	4	6 ?	—	2	?
Chaplet	2	4	8 ?	—	1	?
Miscellaneous	—	5	11 ?	—	2	?
Total	25	51	108 ?	18	31	30
Induction:—						
Kjellin	10	10	10	2	2	—
Röchling-Rodenhauser	3	6	12	7	8	5
Frick	2	1	2	—	—	4
Miscellaneous	3	4	2 ?	3	—	?
Total	18	21	26 ?	12	10	9
Total—Arc and induction	43	72	134 ?	30	41	39

During the first years of its practical development, the electric steel industry made rapid headway. The first practical electric melting furnace was set to work in 1903-4, yet in 1908 there were 43 arc and 30 induction; in 1910, 82 arc and 31 induction; and in 1913, 138 arc and 35 induction furnaces in service. Though

* Abstract from the *Elektrotechnische Zeitschrift.*

the number of induction furnaces now in use compares unfavourably with the number of arc furnaces, comparison on a tonnage production basis is more favourable to the former type. Both arc and induction furnaces have their own spheres of utility. The hopes engendered by the rapid development of electric furnaces ten years ago have not since been realised, the data presented in Table II being by no means so favourable as would be expected for new apparatus and processes of proven merit.

TABLE II.—Electric Steel Production, 1908-13.

Tons per annum.	1908.	1909.	1910.	1911.	1912.	1913.
Germany and Luxembourg ...	19,536	17,773	36,188	60,654	79,190	88,881
France	2,289	6,456	11,759	13,850	15,922	*
Austria-Hungary	4,533	9,084	20,028	22,867	21,556	26,837
America... ...	6,112	13,762	52,141	29,105	18,602	*
Total ...	32,590	47,039	120,116	126,476	135,270	*Not yet avail'ble

The decrease in the American figures is due to reversion to experimental work in the States. Patent records show that finality in electric furnace design is by no means achieved; indirectly these records expose many defects of existing furnaces. No electric furnace has yet been devised which combines the special and undoubtedly important advantages of all the types at present in practical use. This fact alone would explain the slow progress made recently in electric steel manufacture, but there are also two other unfavourable factors to be considered. The quantity of electrical energy consumed in an electrical furnace is so considerable, that the latter can only compete with other types in the manufacture of high-grade steels, so long as electric tariffs stand at their present level. In melting low and medium grade steel, other furnaces are cheaper and more applicable. The second obstacle to the development of electric furnaces is the difficulty of building furnaces for charges exceeding 15 tons; few, if any, furnaces have been built for over 25 tons' charge, and it is not yet certain that even such sizes give permanent satisfaction. Of 67 Héroult furnaces now in use or under construction, one is of 30 tons, two of 25 tons, and five of 15 tons' capacity. There are in use one 15-ton, two 12-ton, and one 10-ton Girod furnaces; and one 12-ton and one 10-ton Nathusius furnaces.

With the exception of Röhling-Rodenhauser furnaces up to 4 tons' capacity, no furnace can be connected directly to a high-pressure 50-cycle three-phase circuit without the intervention of converters or transformers. Large R.-R. furnaces and all other induction furnaces must be supplied at 5 to 25 cycles per second if a reasonable power factor is to be secured. The cost of special generators or rotary converters is serious. Arc furnaces usually require pressure-reducing transformers, and the melting current (some thousands of amperes) must be carried into the furnace instead of being induced in the charge. About 15,000 amperes at 100 volts is required in a 15-ton arc furnace, and in larger furnaces satisfactory electrode construction is most difficult. Not more than 6 or 7 amperes can be carried per sq. cm. section, hence 20,000 amperes requires an electrode 63 cm. in diameter. This is difficult to make homogeneous, and breaks easily. Difficulties are yet greater in 25 or 30-ton furnaces. The floor heating practised in the Nathusius furnace permits fully 20 per cent. greater heating with given top electrode dimensions. Escaping flames cause rapid oxidation of electrodes above the point where they enter the furnace roof: as the reduced section descends, the clearance becomes larger and the trouble is accentuated. Attempts have been made to water-cool electrodes at this point; to protect them by refractory rings or by netting covered with refractory cement; and to prevent combustion by delivering inert gas on the electrodes through ring-pipe nozzles.

The satisfactory development of electric furnaces has been much hindered by the mistaken policy of ironmasters building home-designed furnaces to which they apply electrical apparatus bought ready made. Naturally, the most elementary principles of electrical engineering are frequently contravened; the performance of the furnace is unsatisfactory, its power factor is low, and depreciation is rapid. On the other hand, it cannot be denied that electrical manufacturers have often, in the past, overlooked the requirements of steel workers.

Many endeavours have been made to improve the power factor of induction furnaces and to use with the latter a form of bath or hearth suitable for refining purposes. Not much success has attended efforts to melt cold charges in induction furnaces, and those arrangements which have given the best form and position of hearth have involved carrying the heavy melting current through a sufficiently heavy secondary winding, thus introducing one of the chief defects of arc furnaces and making the furnaces no longer of the true induction type, in which melting current is generated solely in the charge itself. A fluid slag at higher temperature than the charge is produced automatically in arc furnaces, but in induction furnaces it can only be secured by superheating the molten metal.

The interests of the electrical industry would be better served by the great increase in consumption of electrical energy which would follow the perfecting of a simple and economical electric furnace, than by the existing and probable future demand for the special generators, transformers and conductors necessary under existing conditions. For some years past satisfactory electric blast furnaces have been in operation in Scandinavia and California, and their further development and application would be of immense importance to the electrical industry. To smelt a ton of pig-iron requires about 2,500 KW.-hours, hence commercial success is only to be expected in countries where cheap hydro-electric power is available near iron mines, and coal supplies sufficient for purely metallurgical requirements

NEW PATENTS APPLIED FOR, 1914.

(NOT YET PUBLISHED).

Compiled expressly for this journal by Messrs. W. P. Thompson & Co. Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

18,737. "Dynamo-battery electric systems." G. E. Mortley. August 17th. (Complete.)

18,738. "Electrically-actuated tools." W. J. Mellersh-Jackson. (Commonwealth Electric Tool Co., United States.) August 17th. (Complete.)

18,747. "Automatic current cut-off for electrical appliances." Ulysses Schuyler Smith. August 17th. (Complete.)

18,751. "Coherers." British Thomson-Houston Co., Ltd. (General Electric Co., United States.)

18,761. "Terminal-boxes for electric cables." W. B. Woodhouse and Callender's Cable & Construction Co., Ltd. August 17th.

18,775. "Electric lamp-holders." F. C. Lyster. August 18th.

18,809. "Pocket flash-lights." W. J. Mellersh-Jackson. August 18th. (Samuel Isaac Posen, United States. Complete.)

18,810. "Electric primers." C. F. Lindsay. August 18th. (Convention date, September 8th, 1913, United States. Complete.)

18,823. "Electric light, to illuminate the music for brass or reed instruments." J. E. Wood. August 19th.

18,829. "Electrical starting-mechanism for internal-combustion engines." F. H. Royce and Rolls-Royce, Ltd. August 19th. Complete.

18,869. "Spring terminal for electric batteries." G. Pearson. August 20th.

18,870. "Combined lamp-holder and contacts for electric portable lamps." G. Pearson. August 20th.

18,872. "Mercury switches." G. Jacobus van Haersma Buma. August 20th. (Complete.)

18,882. "Systems of electric distribution." British Thomson-Houston Co., Ltd. (General Electric Co., United States). August 20th.

18,887. "Variable-pole dynamo-electric and like machines." F. Creedy. August 20th.

18,920. "Means of overcoming electrical disturbances." E. S. Heurtley. August 21st.

18,942. "Electric switches." J. H. Tucker and J. A. Crabtree. August 22nd.

18,954. "Electric railway signalling." J. Gardner. August 22nd.

18,960. "Electrolytic process for the production of iron tubes, sheets, and the like with an incorrodible surface." S. O. Cowper-Coles. August 22nd.

18,961. "Process for the electro deposition of lead." S. O. Cowper-Coles. August 22nd.

18,962. "Process for the electro deposition of iron." S. O. Cowper-Coles. August 22nd.

18,963. "Process for banding projectiles." S. O. Cowper-Coles. August 22nd.

18,964. "Process for coating metallic surfaces with brass." S. O. Cowper-Coles. August 22nd.

18,965. "Process for coating metallic articles with lead." S. O. Cowper-Coles. August 22nd.

18,966. "Electrolytes for the electro deposition of zinc." S. O. Cowper-Coles. August 22nd.

18,967. "Electrolytic process for the production of rustless iron." S. O. Cowper-Coles. August 22nd.

18,968. "Electrolytic process for the production of rustless iron alloys." S. O. Cowper-Coles. August 22nd.

18,971. "Electric distribution systems." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) August 22nd.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1913.

5,088. Electric Safety Lamps. G. A. Dicker. February 28th. (August 28th, 1913.)

15,463. Galvanic Cell. P. Burger. July 4th. (July 6th, 1912.)

17,733. Galvanometers, Voltmeters, Ammeters, and like Instruments. A. Onwood. August 1st.

17,926. Electrically-controlled Valve. H. J. Read and W. J. Bransom. August 6th.

18,000. Liquid Resistances. Akt.-Ges. Brown, Boveri, et Cie. August 7th. (August 8th, 1912.)

18,072. Electric Furnaces. W. N. Crafts. August 8th.

18,103. Apparatus for Measuring the Magnetic Potential between any two points of a Magnetic Circuit. W. Rogowski. August 8th. (August 9th, 1912.)

18,122. Telephone Exchange Systems. Western Electric Co. (Woodward, acting for Western Electric Co.) August 8th.

18,321. Telegraphy. United Telegraph & Cable Co., and W. M. Bruce, Jnr. August 12th.

18,326. Wireless Telegraph Receivers. Marconi's Wireless Telegraph Co. and H. J. Round. August 12th.

18,447. Incandescent Electric Lamps. British Thomson-Houston Co. (General Electric Co.) August 13th.

18,479. Electric Contact Device for use with Semaphores, Small Lifts, and the like. A. Schalch. August 14th.

19,220. Telephone Call-recorders. D. J. McGauran. August 25th.

19,271. Electric Devices for Calling any one of several Stations connected to the same line. Siemens & Halske Akt.-Ges. August 25th. (August 24th, 1912.)

19,475. Automatic Retrieving Devices for Trolley Collectors of Electric Traction Systems. C. Kodderitzsch. August 28th.

20,008. Electrometers. B. Szilard. September 4th. (October 15th, 1912.)

20,216. Unspillable Electric Accumulator Cells. W. Thomson. September 8th.

20,773. Automatic Telegraph Systems. D. H. Cameron. September 15th.

21,480. Electrical Connection Devices for Railway and like Vehicles. L. Boirault. September 23rd. (Addition to 13,820/13.)

22,223. Manufacture of Carbon Electrodes for Electric Arc Lamps. C. Conradty (firm of). October 2nd. (July 2nd, 1913.)

26,338. Interrupter for Electro-Magnetic Ignition Devices. E. Rogalski. November 17th.

26,733. Electric Controlling Mechanism for Marine and like Engines. S. Rumolino. November 20th. (Patent of Addition not granted.)

27,148. Electric Lighting Apparatus. Cold Light (Dussaud Processes), Ltd. (Soc. Internationale de Lumiere Froide (Procédés Dussaud)). November 25th.

27,409. Earthenware Troughs for Electric Cables. H. L. Doulton and C. E. Morris. November 28th.